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Market Readjustment Has Constructive Value

RECORD-BREAKING as has been the fall in stock market values in the past two weeks, there should result a sounder position for many utility securities. Except for companies with large security holdings which may have been acquired at high prices, there will be little effect on real values unless the psychology of the situation reacts to the detriment of general business.

Most security prices had gone far beyond the figures justified by current earnings, and an orgy of public and investment trust speculation in the popular utility stocks not only raised prices but in addition disturbed the market for bonds and preferred stock. Future earnings were discounted too greatly.

It is only necessary to note the 10 to 12 per cent increase in energy sales this year as compared with last year and to read the current financial statements of individual utilities to know that the light and power industry has had a splendid year financially. Stock values will react ultimately to these good earnings as the conditions brought by the collapse are readjusted.

Gossip has it that the first stages of the market collapse were welcomed by international bankers and investment trusts. To bear this out evidence is adduced that ample liquid assets were available to support security prices but that the policy seemed to be to push prices down by throwing large blocks of stock on the market. Like any intelligent investor, the investment trusts, it is argued, hoped to buy back at a low price so as to show good returns for another year, and the bankers and brokers did likewise, largely to create a favorable market position for bonds and preferred stocks. How much truth there is in this kind of analysis and gossip, however, is difficult to ascertain. Assuming its truth, a danger to an industry and to a business would be indicated, but evidently the situation got out of hand as public psychology, evidenced in a frantic insistence to be out of the market at any cost, held sway. The high money rates of the Federal Reserve had failed to halt the bull market, and the low rates prevailing during the smash did little to halt the bear market.

Under certain conditions the banks and investment trusts can swing market prices up and down at will, and there is no agency to control this action except the business sense of their leaders. If they maintain market prices on a reasonable basis, well and good; but if they swing market prices to show good earnings, then the industries whose securities they juggle will suffer.

Utility security values should increase year by year at a reasonable rate because they reflect the growth of America and a complete diversification in American activity.

It is to the advantage of the industry that a steady increase in prices be maintained, for artificial stimulants or depressants are injurious to the industry. The ideal condition has yet to be reached, but it is the goal that utility financiers and executives should try to attain.

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Holding-Company Groups and the Independent Station

WHAT will become of the independent generating system? Will it, as some careful observers suggest, muster up its resources to equal the economies effected by large-scale production and distribution or will it eventually fall into some holding-company group? Certainly, absorption of electric light and power properties has been going on at an accelerated pace during the last two years, but not always because the individual property was inefficient. Oftentimes consolidation was effected to offer a market for surplus energy or to utilize capital investment more fully. And yet it is apparent that for many years to come independent generating systems will persist, because the gap between them is too great at present to bridge economically by any interconnection.

It does not follow, however, that there is to be any great development of independent stations. The day of such systems existing apart from some holding-company group seems rather definitely over. The insuperable difficulty is to obtain capital and operating talent as favorably and of as high caliber as do the large systems. For obvious reasons it is increasingly difficult to get really promising men to interest themselves in any of the small properties. Nevertheless, the spirit behind independent systems should not be permitted to die, but will be nurtured and kept alive by every holding-company operator of discernment and understanding.

It was the independent system that carried electricity into the highways and byways and which in establishing itself shared all the risks of pioneers. It is the independent system which today serves the least pro-

ductive field. In it personal contact is pre-eminent, whereas the great danger to many holding companies lies in the fact that in them personal contact is lacking and the spirit of adventure and initiative is suppressed. The independent operator oftentimes saw what was not, but he brought it to pass, and vision of that kind counts for more in an industry than all the machine-made efficiency of organizations and power stations. Our best holding companies are made up of independent systems, each largely self-governed and living its own life, but all imbibing inspiration and strength from men firmly banded together in the same business and animated by a zeal to spread the use of electricity to the remotest corners of their territory.

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Chicago's Electric Association Sets an Example

DURING the four years in which it has held annual dinners the Electric Association, Chicago, has brought together a group of electrical executives and caused them to rub elbows with leading railroad, banking and industrial magnates of the Chicago district. This accounts for the serviceableness of the dinners. Conceived on a high plane, they stimulate by expression and impression. Nor is the effect on Chicago altogether meager. Once a year the men primarily concerned with electrical development in that important center endeavor to get above the mists and fogs of petty things and review their accomplishments. This of itself is a wonderful thing and acts as a stimulus to the electrical industry each year to outstrip its previous record.

But the Electric Association is wise enough to take others into its vision, recognizing that to be effective its enthusiasm must be shared with others and that to grow it must be invested outside itself. Thereby it has achieved what many other organizations of its kind are still striving somewhat blindly to attain. It has widened its horizon and revealed that while Chicago is a great city, it is destined to become greater—aye, and more beautiful. To that end the Electric Association is making its contribution, and a glance about the city or a talk with any of its business men proves it to be a considerable one.

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More Than an Expedient

A COMPLETE test is a laborious method of determining the best operating conditions for water-power units because it involves measuring all the factors entering into the situation. It is a big job even on a small unit and involves considerable expenditure of both time and money. Furthermore, such a determination, though made with the most meticulous care, is not of continuing value throughout the life of the unit. It must be checked periodically to cover the naturally changing conditions of operation. If the check must be as elaborate and expensive as the original test, there is a readily understood tendency to make it as infrequently as possible and to go along operating on data that may present very far from a true statement of existing conditions.

But it is not necessary to make accurate measurements of all the factors entering into hydro plant operation in order to establish a curve of operating efficiency, according to F. Nagler, who discusses the subject in this issue. Working on the basis that the best point of efficiency of a unit lies at or near the break in its output curve, the shape of the operating curve may be deduced from gate openings and load in relation to the index of a single factor—water flow. It is not necessary to determine all of the other factors as would be necessary in a complete test. The simple testing apparatus required in the methods described by Mr. Nagler may be permanently installed and its indications easily and quickly read. By its frequent use the operating efficiency curve may be kept continuously as a true and accurate statement of hydro unit performance.

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Widespread Advantages Possible in Standardizing Manhole Fittings

STANDARDIZATION is not, and should not be, considered as an end in itself. It is not justified unless the results accomplished more than compensate for the effort and the limitations imposed. However, in a number of specific cases an effective and general standardization would result in real benefits to the industry both economically and from the point of view of service.

Such is the case with certain fittings for manhole equipment. As an example, a recent survey of terminals and wiping bushings for bringing lead-covered cable into a piece of manhole equipment and making the connections to the main terminal of the apparatus indicated a wide variety of types, the variation being not only one of fundamental design but of dimensions and location of the cable entrances on each particular type of apparatus. When the variations in dimensions necessarily introduced by using the various sizes of cable are considered, such a chaotic condition results that any possibility of interchangeability of apparatus of different manufacture is impossible.

Interchangeability of manhole apparatus is essential so that one piece of equipment can be removed and another substituted with a minimum loss of time both from the standpoint of maintenance costs and the quality of service rendered. Manhole equipment would be more or less freely interchangeable if it were possible to disconnect a terminal, remove the wiping sleeve from the case of the apparatus and reconnect it to another piece of apparatus without requiring a new sleeve to be

wiped onto the cable or the terminal connection to be changed. Such a procedure is almost essential in view of the fact that frequently customers are out of service while manhole equipment is being changed. The savings in maintenance costs that result when such interchangeability of equipment is available make the necessary standardization highly desirable.

Standardization could readily be effected by both manufacturers and operators agreeing upon the general type and design and upon a range and a certain number of sizes for each class of apparatus. In reaching such an agreement it is quite essential that both the manufacturers and the operating engineers approach the problem open-mindedly and consider its broader aspects, forgetting minor differences of opinion and unselfishly adopting that which will result in the greatest good to the industry.

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To Guide the Airman Home

ONE of the popular myths of the day has to do with the fog-penetrating qualities of neon lamps. Like all good fairy tales, it persists long after its charming illusion has been dispelled by unnecessarily matter-of-fact knowledge. Neon beacons, for some inexplicable reason, have been regarded as possessing a magic power which brushes aside the perils of mist and cloud and brings the airman home safe and sound. Engineers interested in the more universally used incandescent lamp have been incredulous—being engineers and human; they have besought high heaven to witness the dreadful ignorance of those who saw magic in the commonplace.

In the course of time as such things go the Bureau of Standards marshaled its experts and keen-eyed observers, hid neon and incandescent lamps both with and without color screens at discreet vantage points, arranged that horizontal intensities should be equal for comparative observations and left wind and weather to provide the test conditions. As a result one may find a neatly printed and bound brochure explicitly demonstrating that neon and color-screened incandescents of equal intensities are in every way identical in fog-piercing effect.

But—and here is where the man who knows things that are not so has his little moment of triumph—it was proved demonstrably easier to pick up the neon lamp than it was to select the white light when test sources were at locations unknown to the observer. This was largely due to reduced competition with other light sources when neon was used.

And so it is with most differences of opinions: Definitions and not facts or fancies are at stake. What the airman wanted to say was, "I can find that red-colored light better in bad flying weather than any other," and science, having proved him wrong, at the same time proves him right.

Delivery-Cost Analyses More Essential as Transmitted Power Grows

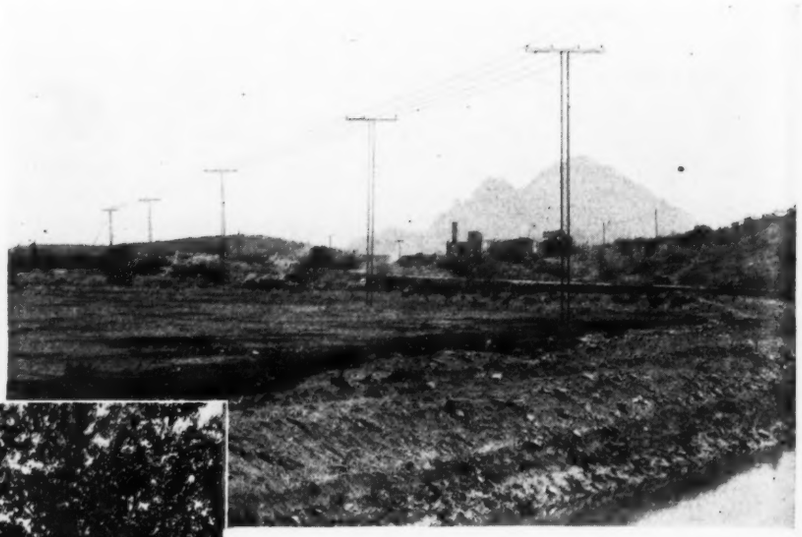
AS THE scale on which transmitted power is utilized through interconnection grows larger, refinements in output control assume rapidly increasing importance. The operating engineer of a great system needs to possess minute information as to over-all costs of delivering energy in bulk at load centers or interchange points, and must constantly realize that the price of mistakes which would be merely of minor consequence on small local properties is greatly amplified when applied to many regional situations. This is particularly true in connection with hydro-steam tie service and requires long and arduous analysis of the relations between rainfall, run-off, storage facilities, plant handling and tie-line operation.

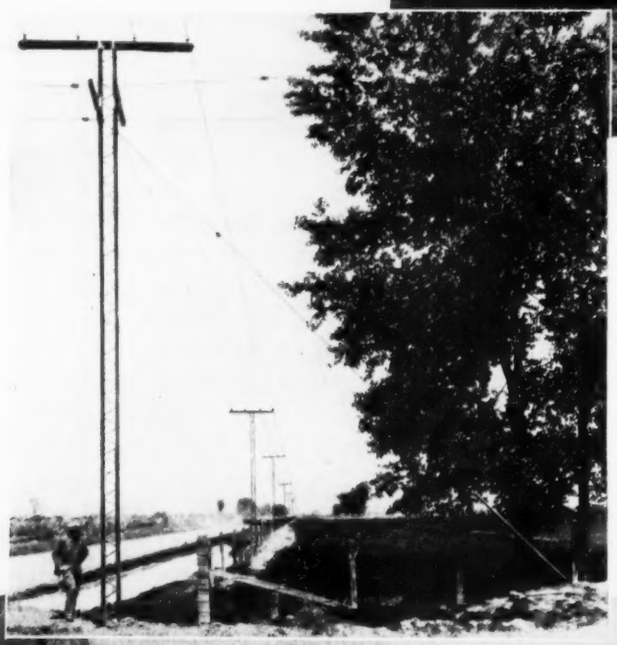
Major projects receive extremely thorough analysis by engineering consultants prior to construction, but this is not enough to insure the maximum economic use of interconnected resources after operation becomes established routine. Too many variable factors govern the efficiency of hydro-steam tie service to allow adherence to rigid schedules. The primary requisites are a system set-up facilitating the flexible handling of water plants and of fuel-consuming plants plus skill in forecasting loads and hydraulic conditions. The designing engineer can anticipate a great number of combinations and analyze them with sufficient accuracy to select equipment and build lines and plants that set the stage for the best results, but forecasting skill grows with its exercise and operating experience is the final source of improvement in interconnection practice.

Increasing attention is being paid to the analysis of energy delivery costs through wide variations of volume handled at interchange and take-off points; to the comparison of daily performance with previously estimated loads, energy transfers and monetary outlays and receipts; to the effect of emergency conditions on the economic log sheet; to the maximum utilization of the investment, and to the compilation and interpretation of water conditions and weather influences upon hydraulic resources at plant.

There is an additional opportunity to improve interconnected system practice through the increased use of graphic methods illustrating all manner of energy source variations in their effect upon the transfer and delivery of bulk energy to meet load demands. These methods often yield vitally important information as to what might be called economic turning points in system handling, showing, for example, when a hydro plant should be run as a base-load and when as a peak-load installation, and similarly as to steam stations. The adjustment of such analytical methods to meet the changing conditions, accompanied by the activities stimulated by mergers and improvement of regional organizations, bid fair to keep the operating engineer responsible for service and costs on the *qui vive* for some time to come.

Salt River Power for 8,000 Farms





THE government-built, privately operated Salt River irrigation project in Arizona will distribute its power output to 8,000 farms by means of a 4-kv. line on steel poles at 330 ft. normal spacing.

"State Line"—A Departure *from the Conventional*

Erected on "Made Land" in Lake Michigan

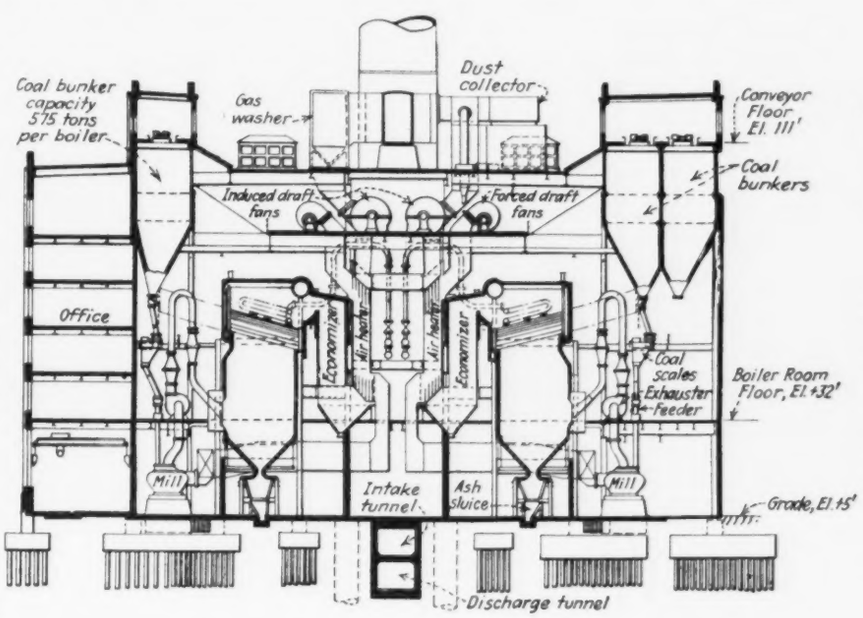
22,000-volt generation, five-stage feedwater heating, vertical condensers, remote circulating pumps, compact boiler house, roof type flue-dust removers, under-water coal storage and integral transformers and lines are other features

THE 208,000-kw. unit of the State Line generating station, just recently put in operation on the shore of Lake Michigan adjacent to the Illinois-Indiana line, feeds into virtually the center of that great power district around Chicago having an interconnected generator capacity of 1,517,700 kw. It is expected that five units will be eventually installed, giving a total of 1,000,000 kw. under one roof. The entire output of this station, which is operated by the State Line Generating Company, has been contracted for by the Commonwealth Edison Company, Public Service Company of Northern Illinois, Northern Indiana Public Service Company and Interstate Public Service Company, which collectively control the State Line company.

Magnitude is not the only feature of this station. Other interesting characteristics are:

The station is built on "made" land surrounded on three sides by Lake Michigan. High-voltage generation, five-stage feedwater heating and four condensers per low pressure unit are used. The circulating pumps are in the crib house, small building space is used per unit of steam developed, flue-dust removers are on the roof, 125,000 tons of coal are stored under water, very unconventional electrical construction is employed, and transformers which are integral with the lines are employed. The auxiliary load totals 34,500 hp. and less conduit exists than in the customary station built in this country.

The ground space devoted to the boiler and turbine room measures 380 x 210 ft., while a 290 x 150-ft. plot



Powdered-Coal Furnaces with Unit Mills and Roof Type Flue-Dust Removers

Six boilers equipped with economizers, air preheaters and water walls supply 208,000 - kw. unit, although four will serve in emergencies. While the furnaces are large, only 985 cu.ft. of boiler house space is used per 1,000 lb. of steam developed.

is devoted to the electrical equipment, which is largely outdoors.

Three 22,000-volt turbo-generators with 13 per cent inherent reactance comprise the 208,000-kw. unit—one 76,000-kw. high-pressure element and two 62,000-kw. low-pressure elements. Any generator may be taken out of service for inspection or efficient loading. The high-pressure turbine operates at 650 lb. pressure and 730 deg. steam temperature, exhausting through reheaters which deliver 110-lb. 500-deg. steam to the low-pressure units. As previously mentioned, five-stage feedwater heating is used.

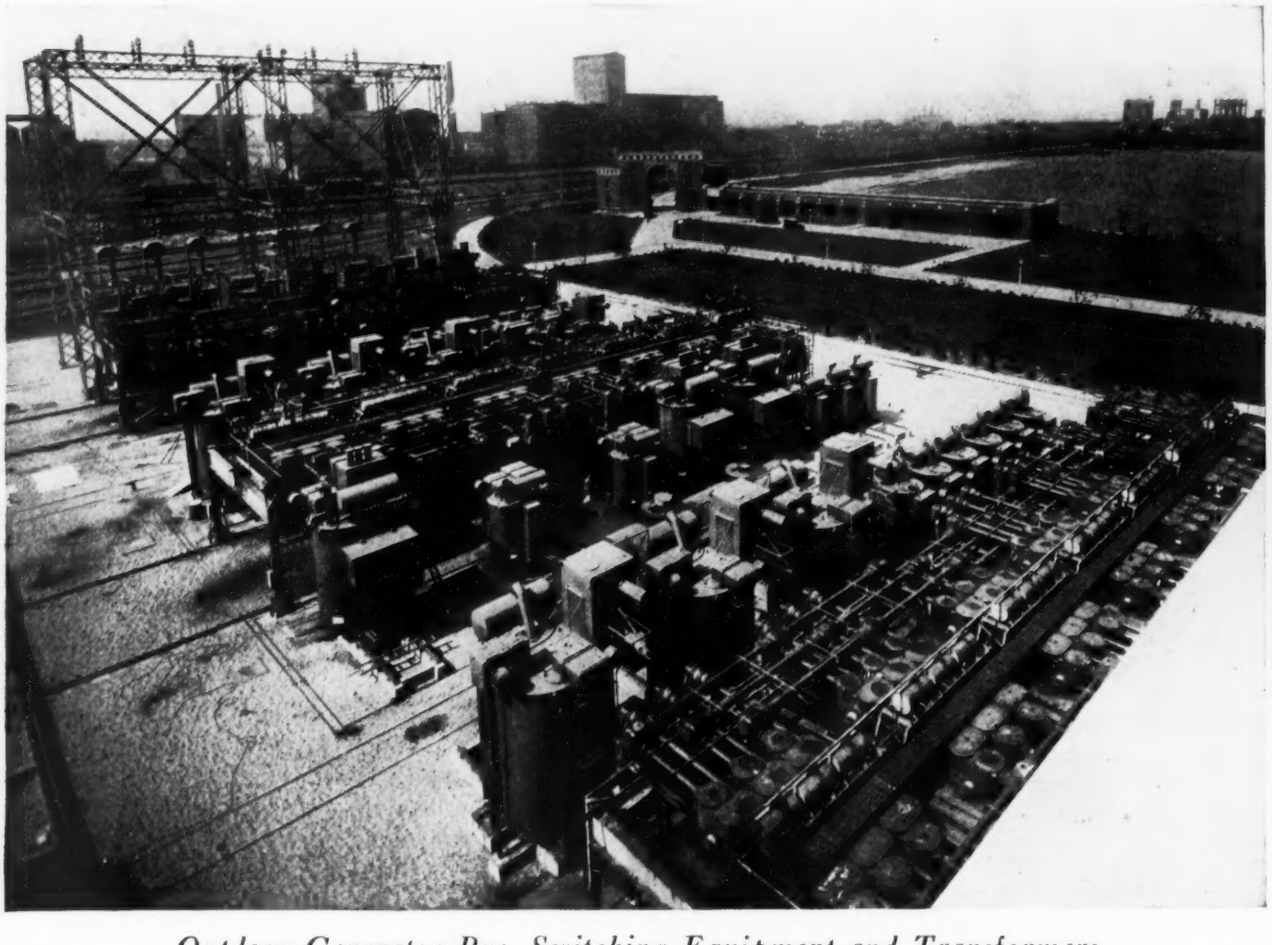
Double-flow low-pressure turbines are used, each exhausting into four vertical surface condensers. Instead of having the circulating pumps at the condensers, they are installed in the crib house and driven by vertical shaft motors.

Six boilers, equipped with economizers, air preheaters and water walls, supply steam for the 208,000-kw. unit, although it is expected that four will be sufficient in emergencies. Each boiler is capable of developing 450,000 lb. of steam per hour. While the furnaces are relatively large compared with the boilers, only 985 cu.ft. of boiler house space is required per 1,000 lb. of steam developed.

Pulverized coal combustion is used, four different types of flue-dust removers being installed on the roof of the station. Twenty-five per cent of the coal storage provided, or 125,000 tons, is under water. High-pressure water jets sluice the ashes to a receiving pit, from which they are loaded into cars by a grab-bucket crane.

The conventional switch-house with its bus and switch cells is not used. Instead, the generator bus, switching equipment and step-up transformers are installed outdoors. Even this equipment is unconventional, the buses being inclosed in oil-filled bronze pipe and the connections in oil-filled bronze junction boxes, each phase being isolated. As indicated by an accompanying illustration, no open-wire circuits or buses are used, all circuits being metal clad.

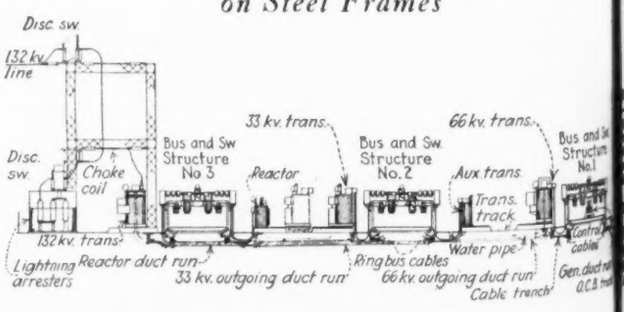
A three-section double-ring bus is used with one gen-

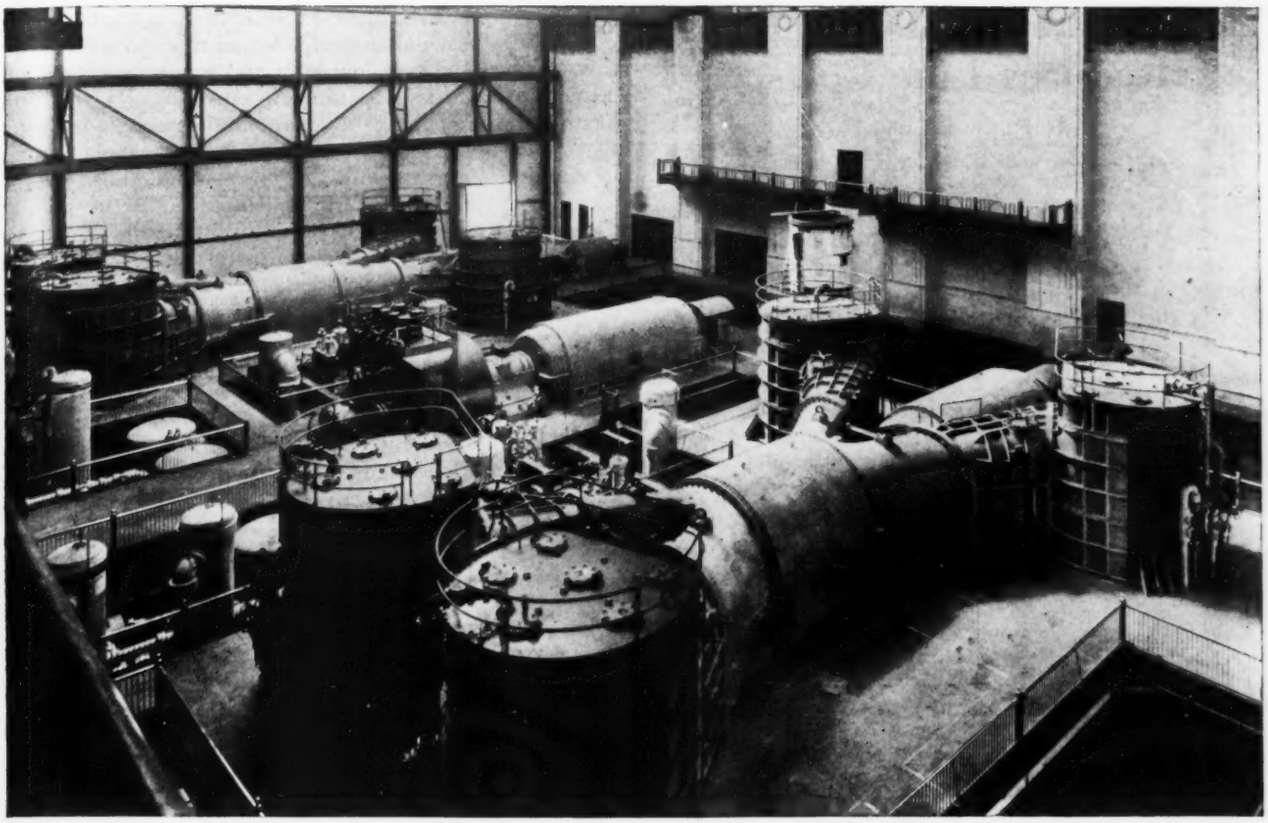


Outdoor Generator Bus, Switching Equipment and Transformers

No open-wire circuits are used. Metal-clad isolated-phase construction is employed, each bus being in an oil-filled bronze pipe and the connections in oil-filled bronze junction boxes. No disconnects are used, the oil circuit breakers being disconnected by lowering with an elevator. The transformers are integral with their respective transmission lines.

Outdoor Metal-Clad Generator Bus and Oil Breakers Mounted on Steel Frames





208,000-Kw. Unit Comprised of Three Elements

The three 22,000-volt generators with 13 per cent inherent reactance are driven by one 76,000-kw. high-pressure turbine and two 62,000-kw. low-pressure turbines.

A pressure of 650 lb. operates the high-pressure element and 110 lb. is used in the low-pressure elements. Five-stage feed-water heating is employed. Four vertical condensers receive the exhaust of each low-pressure unit, the circulating pumps being installed in the crib house.

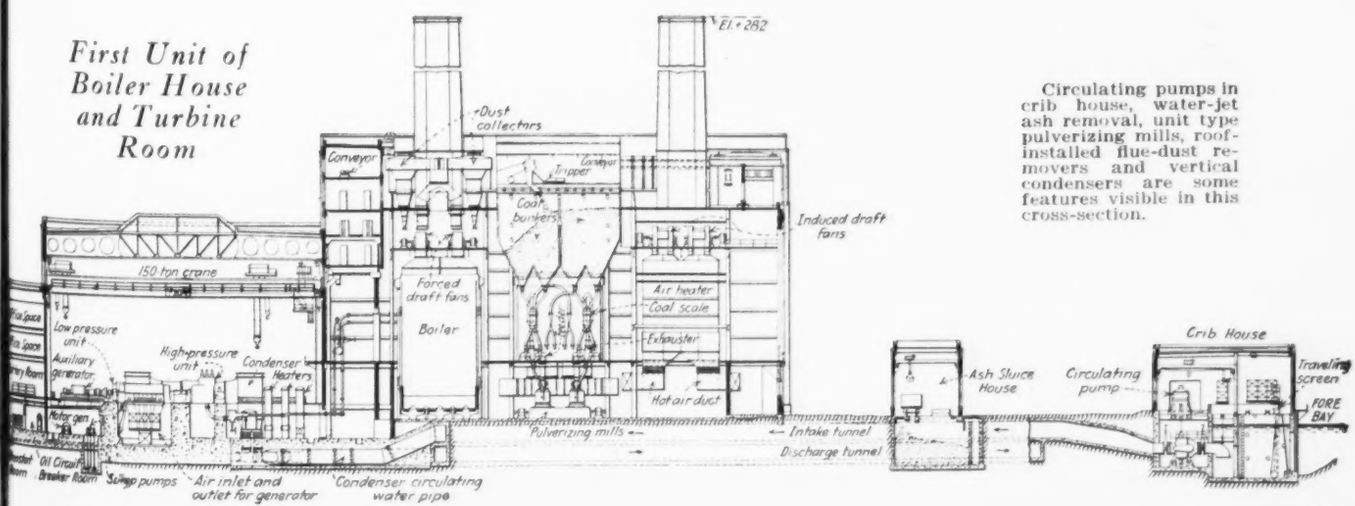
erator connected to each section, and metal-clad oil-immersed reactors and oil circuit breakers are inserted between sections. All of the 22-kv. oil circuit breakers may be disconnected from their respective circuits by lowering with a traveling elevator to permit inspection or handling of oil.

The transformers, which are integral with their respective transmission lines, step up the voltage to 33 kv., 66 kv. or 132 kv., depending on the requirements. Eighteen transformers, totaling 360,000 kw., are installed to permit flexible operation.

All electrical connections are made with single-conductor armored cables. Very little conduit is used, the conductors being installed in groups in spiral steel pipe or steel trays.

For station auxiliary power supply several sources are provided—two 4,000-kw., 2,300-volt generators on the shafts of the main low-pressure turbines, two 9,000-kw. transformers, seventeen motor-generator sets and two 100-kw.-hr. storage batteries. The 25,000 hp. in a.c. station auxiliaries is comprised of 225 units ranging from ½ hp. to 750 hp., operating at voltages of 2,300, 460, 230 or 115 volts, depending on the service. Direct current is used for 80 auxiliaries (950 hp.), the units ranging from ½ to 450 hp. The station and yard lighting totals 500 kw. and is supplied by eight transformers.

First Unit of Boiler House and Turbine Room



Circulating pumps in crib house, water-jet ash removal, unit type pulverizing mills, roof-installed flue-dust removers and vertical condensers are some features visible in this cross-section.

Stubbing Poles Reduces Line Costs

By C. M. Marple
Iowa Public Service Company, Carroll, Iowa

THE Iowa Public Service Company has adopted a general policy of stubbing old pole lines, believing that the cost is justified in the longer life of the poles and the saving in the cost of transferring the load to a new line. For this purpose Southern pine stubs and patented galvanized steel bands have been used with good success. The average cost of stubbing a pole line is around $10 per pole, and while this amounts to about 30 per cent of the cost of a new pole, it is only about 10 per cent of the total cost where there is a heavy lead or other special condition. In cases where the upper part of the pole is in good condition but badly rotted at the ground line the use of a treated stub will increase the life until the upper part has weakened, when the stub and bands can be salvaged at practically 100 per cent of their original value and used on other jobs.

Method of Clamping Pole to Stub

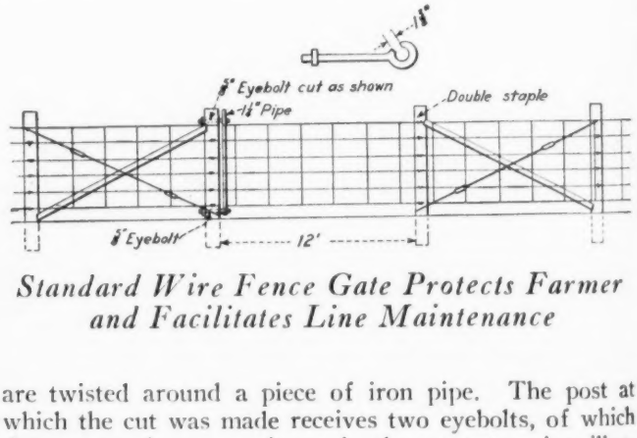
(A) Two clamps are ordinarily used to hold the pole to the stub; (B) after the belt is pulled up, it is tightened by taking up on the through-bolt passing through the saddle set between the stub and the pole.

The old method of bolting the pole to the stub and wrapping with wire required considerable labor and the material was of little or no value when the pole had finished the rest of its life. A new device, known as the Samson stubbing clamp, has been used and found to overcome many of the disadvantages of the old method. This clamp consists of a saddle with an adjustable strap. The saddle is a galvanized steel member conforming to the shape of the pole and stub and is placed between the two before the stub is tamped into place. Usually two are used, one at the ground line and one near the top of the stub. These saddles serve to keep the pole and stub in definite alignment and prevent rolling. After the saddles are in place the strap is bent around the pole and drawn up tight by a transverse through-bolt.

The only tools necessary to install these clamps are a hammer, wrench and small pointed bar. A crew of two men can install 50 or 60 of them in a ten-hour day, which is approximately three times as fast as the old method of bolting the pole and stub and wrapping with wire. The arrangement of saddle and clamp makes a solid connection between the stub and the pole, and even in cases where the pole is entirely broken off at the ground line the stub gives sufficient strength. Since both the saddle and the strap are hot galvanized, the clamp can be used over and over again.

Standard Fence Gate Betters Rural Relations

A SIMPLE and economical way of handling the fence problem through the development of a standard gate has been adopted by the Consumers Power Company on its large Michigan system. After bracing the posts on each side a gate panel is opened by cutting it at one end. At the free end the wires of the fence are twisted around a piece of iron pipe. The post at which the cut was made receives two eyebolts, of which the top one is cut as shown in the accompanying illustration.



Standard Wire Fence Gate Protects Farmer and Facilitates Line Maintenance

It is sometimes necessary to put in two or three new panels if the fence is in bad shape. With the gate open, the panel is pulled back out of the way. To close it the pipe at the end of the panel is dropped into the lower eye and hooked into the opened one at the top. The nuts on the eyebolts are then turned up, tightening the panel and leaving the fence as firm as ever. The use of these gates adds an expense to line construction greater than would be immediately incurred by simply cutting the fence wires and later tying them together. But the latter method is a makeshift at best and is subject to the failures inherent in makeshifts. Such failures often result in damage to crops or to cattle, a single instance of which may cancel on any job the whole saving made possible by the use of the cheaper method. Also the standard gate permits the fence to be opened easily when maintenance crews work on the lines.

Simple Basis for Securing

Efficient Hydro Operation

Determination of characteristics of unit performance is necessary in order to make fullest use of available water. Calculation of operating curve does not require complete test of unit, but may be based on the index of one factor

By F. NAGLER

Engineer Hydraulic Department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

AS THE water resources of the country become more and more developed and greater numbers of hydro-electric plants operate on controlled storage it becomes increasingly important in the utilization of investment that every one of these plants shall work as closely as possible to its best point of efficiency. Departures from this point, except in times of excess water for which no storage is provided, mean actual losses of kilowatt-hours that could have been saved. The quantity of energy lost by inefficient operation may be difficult of exact evaluation, but the loss does exist, and the fact that it is indeterminate should not prevent the effort to save it from being made. To get the most out of a hydro unit a definite operating curve is required. Such a curve is usually considered to be capable of calculation only after extensive tests. Such is not the case, as it is not necessary to make an exhaustive check on a unit in order to erect its operating curve. The curve may be set up on the index furnished by a single and easily secured factor of operation.

In a way all hydro tests are index tests, in that errors or slightly indefinite coefficients such as angular characteristics of current meters, pitot tube coefficients or weir constants are a constant bar to absolute water measurement. The index methods here described simply allow wider latitude in that respect, but in so doing detract in no way from the utility of the resulting operating curve for use in enabling the development of the most kilowatt-hours from available flow. Condition of units may be checked periodically by these methods, but determinations of quantity of water used, absolute efficiencies and comparative performances in respect to other plants may not. The essential features to be watched in making an index test are gate setting, distribution of flow to adjacent units, condition of racks and the use of a single means of measuring output. Gates should always be set by an indicator having the least possible lost motion and always be set in a direction opposite to their drift tendencies.

In this article are given typical examples of operating curves erected on velocity gage, current meter and impact gage tests, together with the mathematics of each case. Whatever manner of test is employed the determination of the curve is based upon the same condition.

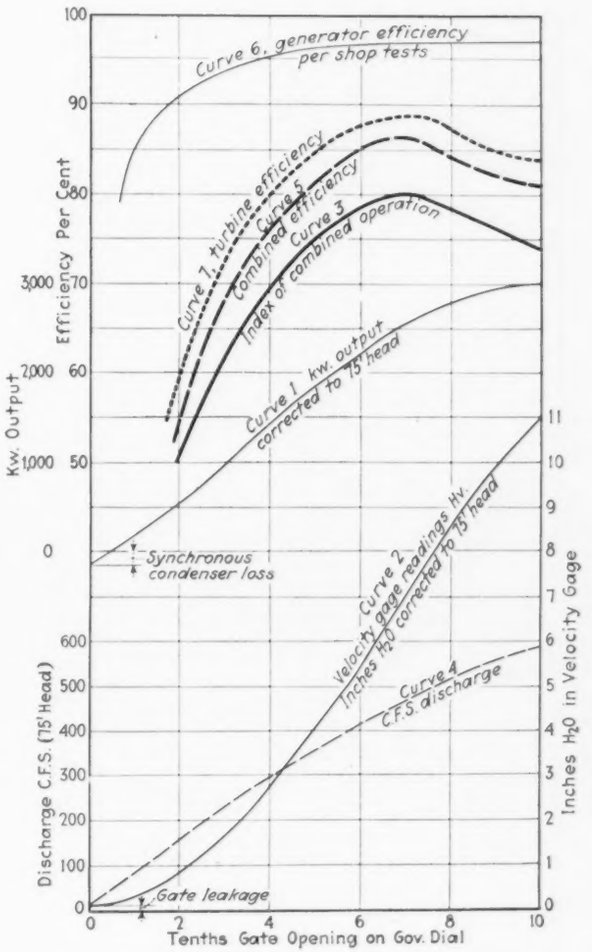

Curve 6, generator efficiency per shop tests
Curve 7, turbine efficiency
Curve 5 Combined efficiency
Curve 3 Index of combined operation
Curve 1 kw. output corrected to 15' head
Curve 2 Velocity gage readings Hv. Inches H2O corrected to 15' head
Curve 4 C.F.S. discharge
Synchronous condenser loss
Gate leakage
Kw. Output
Efficiency Per Cent
Discharge C.F.S. (15' Head)
Inches H2O in Velocity Gage
Tenths Gate Opening on Gov. Dial

Fig. 1—Operating Curve Developed from Velocity Gage Index

This is that the break in the energy output curve of the unit occurs at a gate opening that is at or very close to the most efficient operating point. The other points on the curve are determined in their relations to this one, not necessarily in terms of any test or operating quantities, but only in those relations. That is to say,

the best point at which to operate a unit is at its highest efficiency, but it makes no difference what this point is; the object is merely to establish the curve in relation to it. The break in the output curve is that point where it begins to flatten out, where increases in the gate opening add markedly less to the power output. If the curve has a well-defined "knee" the break is easily and definitely located; if the curve is so smooth as to make the break difficult of exact location the need of its exact location is less important and its reasonable approximation will suffice.

Taken with the foregoing comments, the following examples of typical index test observations, their com-

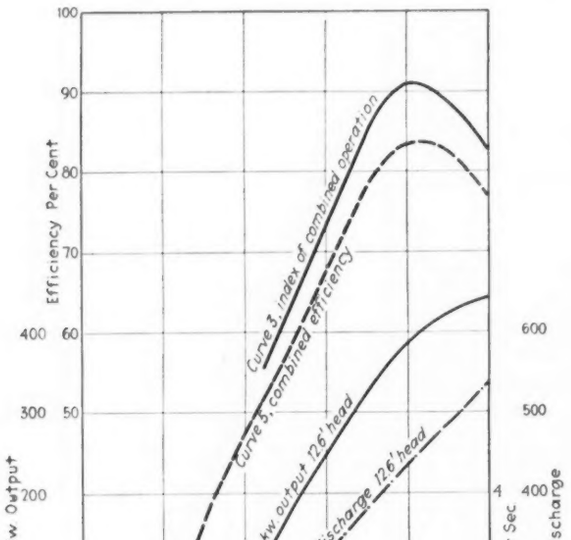

Efficiency Per Cent
Kw Output
Index Velocity Ft. per Sec
C.F.S. Discharge
Curve 3, index of combined operation
Curve 3, combined efficiency
Curve 1, kw. output 12.6' head
Curve 4, C.F.S. discharge 12.6' head
Curve 2, index velocity 1v.
Tenths Gate Opening on Gov. Dial

Fig. 2—Operating Curve Developed from Current Meter Index

putations, efficiency assumptions and determinations of operating or index curves should illustrate the limitations and value of this type of test. It should be remembered that for operating purposes the performance curve may be plotted as efficiency, either high or low, or merely as a meaningless number like kw. divided by square root of impact, without detracting from the value of the resulting curve.

Velocity Gage Index

The application of a straight velocity gage to the determination of the operating curve of a unit is illustrated in Fig. 1. The plant in question had a single unit of 3,750 hp. at 75-ft. head developed through about 500 ft. of 11-ft. diameter penstock. Two velocity gages were available, one including pipe friction and the other only inlet and rack losses and inlet velocity head. The latter was used. It consisted of two glass tubes connected respectively to the pond and to a flush opening in the penstock about 50 ft. downstream from the racks. The upper ends of each were open to atmosphere and brought adjacent to a common scale on which the difference H_v was measured. In this type of gage the utmost care is required to keep pipes to the gages free of air. Any connection that will give a readable displacement is satisfactory, whether it arises from friction, velocity or impact. Readable indications may be obtained from low or high pressure effects by using a differential gage based on liquids of densities greater or less than water. The following are commonly available:

Liquid	Approximate Specific Gravity	Liquid	Approximate Specific Gravity
Gasoline*	0.7	Carbon tetrachloride (carbona)*	1.54
Kerosene*	0.8	Carbon disulphide	1.25
Water	1.0	Bromoform	2.9
Carbon tetrachloride and gasoline*	0.7 to 1.5	Mercury	13.0

*Will retain color in presence of water if tinted with iodine or some of the aniline dyes.

The data of curves 1 and 2 in Fig. 1 are easily obtained on commercial load and to take them requires only an hour or two for all gates. From this data curve 3 is computed and such a curve is all that is needed for plant operation. The data appear in Table I.

Assuming 80 per cent maximum efficiency (90 or 100 or 60 could be assumed with equal utility) at the "break" of the kilowatt curve, where the best efficiency of a turbine usually occurs and which by inspection is at about 0.7 gate, and as the head in the velocity gage is caused by velocity head and friction head we may fairly assume that it is a function of V^2 and we may write:

$$H_v = C\frac{V^2}{2g}$$

or $$V = C_1\sqrt{2gH_v}$$

whence $$Q = AV = AC_1\sqrt{2gH_v}$$

For 11-ft. diameter pipe and expressing H_v in feet in place of the observed inches of water this becomes:

$$Q = 95C_1\sqrt{\frac{2gH_v}{12}} = 220C_1\sqrt{H_v}$$

$$\text{Combined efficiency} = \frac{kw. \times 1.34 \times 550}{Q \times H \times 62.4}$$ which, for 75-ft. head and substituting for Q its value as H_v, becomes

$$\text{Combined efficiency} = \frac{kw.}{C_1\sqrt{H_v} \times 1{,}397} \text{ or } \frac{kw.}{C_2\sqrt{H_v}}$$

Table I—Efficiency from Velocity Gage Index

	1	2		2a —Combined Efficiency—	3
Tenths Gate	Kw. Output	H_v Inches	H_v	Assumed	Figured (Curve 3) Per Cent
10	3,000	11.0	3.32	....	74.0
9	2,920	9.9	3.14	....	76.2
8	2,800	8.6	2.94	....	78.3
7	2,600	7.1	2.66	0.80	80.0
6	2,220	5.5	2.34	....	78.0
5	1,850	4.1	2.03	....	75.0
4	1,430	2.8	1.67	....	70.0
3	960	1.6	1.26	....	62.2
2	550	0.8	0.89	....	50.4
1	200	0.25	0.50	....	33.0
0	—150	Synchronous condenser operation.			

Now using an assumed 80 per cent efficiency as the best point:

$$0.80 = \frac{kw.}{C_2\sqrt{H_v}}$$

$$C_2 = \frac{kw.}{0.80\sqrt{H_v}} \text{ and using values for 0.7 gate}$$

$$C_2 = \frac{2{,}600}{0.80\sqrt{7.1}} = 1{,}220 \text{ approximately,}$$

from which the efficiency for all gates may be figured

$$\text{Combined efficiency} = \frac{kw.}{1{,}220\sqrt{H_v}}$$

giving column 3 in Table I. Incidentally, a curve of kw. divided by $\sqrt{H_v}$ would be as useful for operation, but it is ordinarily desirable to have the curves approximate fairly closely to the absolute efficiency values, which in familiar form peak between 80 per cent and 90 per cent for combined units.

This particular plant was carefully tested by Professor Allen, using the salt titration method. The results are shown in curves 4 and 5. These, of course, give absolute efficiency within the margin of test error and as such make the plant valuable as a check on river flow and to determine whether the units meet the efficiency guarantees. They do not aid in operation otherwise. The turbine efficiency curve 7 is simply deduced from curves 5 and 6.

These curves of Fig. 1 are representative of the velocity gage type of results. I. A. Winter of the Alabama Power Company has carried this principle one step further by using the variation of pressure from the outside to the inside of a spiral casing near the guide vanes for a source of H_v. This is calibrated by a complete test and a permanent recording meter installed after that calibration to show continuous discharge figures. Caution is required, in that connection, not to locate the inner orifice so near the guide vanes as to run into interference that would modify the character of flow past it. E. A. Dow of the New England Power Construction Company has regularly made use of velocity changes in butterfly valves for the same purpose, such a valve acting exactly like a venturi meter up to the limits of its velocity difference.

Current Meter Index

Exactly comparable results may be obtained in open flume settings by using a current meter or several of them. An index point or a series of them are definitely located and the meter or meters read for five to ten minutes continuously to eliminate pulsating flow effects. An index reading is thus obtained that is directly proportional to turbine discharge in place of the square root function of the velocity gage. The sketch (Fig. 3), shows a typical power house arrangement in which this form of gage or index test may be used.

Two current meters were fixed at stations 4 and 11 at elevation 5. Adjacent units were operated at fixed gate positions throughout the index tests and the racks were kept clean. These precautions are of utmost importance. The data obtained are shown in Table II.

With gate openings, kilowatt loads and velocity indices available the procedure was as follows: From the shape of the kilowatt curves in Fig. 2 seven-tenths gate was assumed to be the best point. Any other gate opening might equally well have been taken without any change in shape of curve resulting.

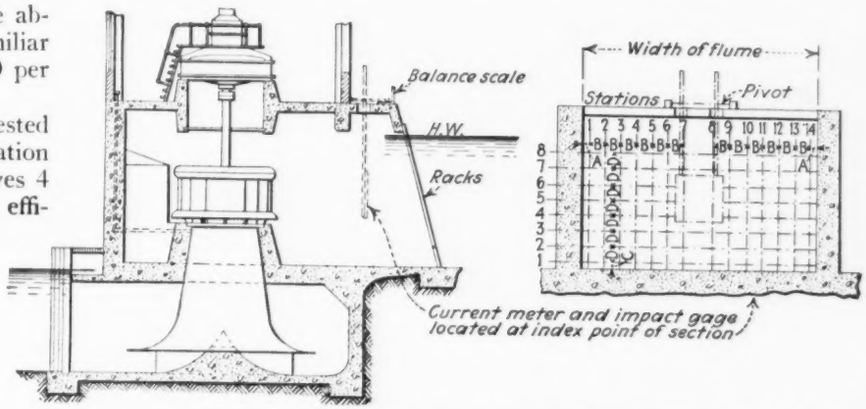


Fig. 3—Cross-Section of Unit Showing Locations of Current Meters and Impact Gage

$$\text{Combined efficiency} = \frac{kw. \times 1.34 \times 550}{Q \times H \times 62.4}$$

but $Q = CI_v$ and $H = 12.6$ ft.

So combined

$$\text{efficiency} = \frac{kw. \times 1.34 \times 550}{CI_v \times 12.6 \times 62.4} = \frac{KW}{I_v C_2} = 0.85$$

Whence $C_2 = \frac{kw.}{I_v \times 0.85} = \frac{320}{2.15 \times 0.85} = 175$

Applying this to the observed index and kilowatt readings column 3 is obtained. This plots as in curve 3 from the relationship:

$$\text{Combined efficiency} = \frac{kw.}{I_v 175}$$

The assumption of 85 per cent at 0.7 gate was in error as subsequent test indicated in curve 5, but our curve 3 is as reliable a basis for operating the unit at its best point as is curve 5 and is obtainable with only a fraction of the cost, time and interference with plant operation as is required for a complete test.

Lacking a current meter or a velocity gage an indicating device may often be improvised at the plant. A rectangle of two by fours covered with wire netting like chicken wire, or even boarded up solid if small in area, may be suspended in a flume of fixed area.

The more nearly it approaches the area of the flume

Table II—Efficiency from Current Meter Index

Gate in Tenths on Gov. Dial	1 Kw. Output 12.6-Ft. Head	2 Average Index Velocity I_v	2a Combined Efficiency Assumed	3 Combined Efficiency Figured
10	443	3.05	..	83.0
9	427	2.75	..	88.7
8	390	2.45	..	91.0
7	320	2.15	85	85.0
6	230	1.80	..	73.0
5	160	1.50	..	61.0
4	....	....	..	....
3	....	....	..	....
2	....	....	..	....
1	0	....	..	....

the more accurate it will be, but if of relatively large size it must be of netting construction to let water through it. A smaller one made solid approaches an index meter in quality of results, whereas the large area netting simulates the composite readings of a current meter traverse. The force on the netting results from both friction and

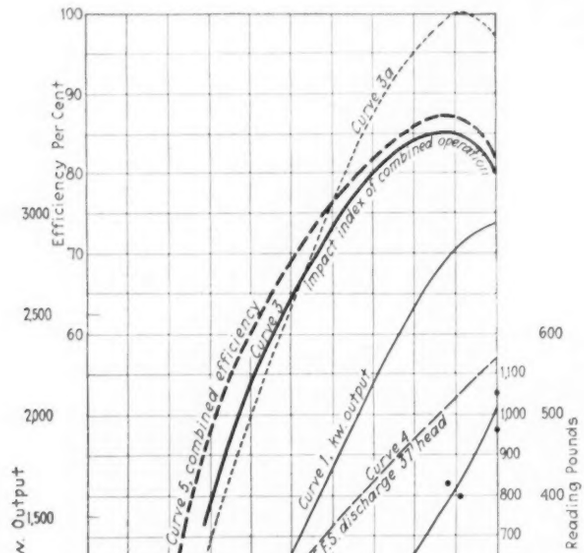

Efficiency Per Cent
Kw Output
Impact Gage Reading Pounds
Tenths Gate Opening on Gov. Dial
Curve 3a
Curve 3, impact index of combined operation
Curve 5, combined efficiency
Curve 1, kw output
Curve 4, C.F.S. discharge 37' Head
Curve 2, index force 1 (impact)

Fig. 4—Operating Curves Developed from Impact Gage Index

impact. That on a flat plate is mostly due to impact. Both are a function of the square of the velocity as with the velocity gage, and the writer assumes that relationship with the impact gage, though some tests indicate that it varies more nearly as V^3. If the initial assumption is made near the point of usual operation it matters little whether V^2 or V^3 is used.

An example of the impact gage reading checked with a weir measurement is given in Table III and plotted in Fig. 4. The impact plate was completely submerged in an open flume and was rigidly attached to vertical two by fours which swung freely about a horizontal pivot located above water level. The plate, being at right angles to the flow, tried to move with it, but was constrained from so doing by a bell crank lever attached to the upper end of the vertical members. The force on the horizontal arm was measured by a scale. The same arrangement could be used with the netting variations. Data were obtained as in the first three columns of Table III.

To develop an efficiency curve from these data, let us assume a best point of 85 per cent at 0.9 gate opening.

$$\text{Take combined efficiency} = \frac{Kv}{C\sqrt{I}} = 0.85.$$

$$\text{Then} \qquad \frac{2{,}830}{C\sqrt{410}} = 0.85$$

$$\text{And} \qquad C = 164.5.$$

The use of this value of C results in curve 3. In this calculation the impact is taken as variable with the square of the velocity.

Assuming that the impact varies with the cube of the velocity and assuming also that the best point is 100 per cent efficiency, we have:

$$\text{Combined efficiency} = \frac{kw.}{C\sqrt[3]{I}}$$

$$\text{Then} \qquad \frac{2{,}830}{C\sqrt[3]{410}} = 1.0.$$

$$\text{And} \qquad C = 382.$$

from which curve 3a is plotted.

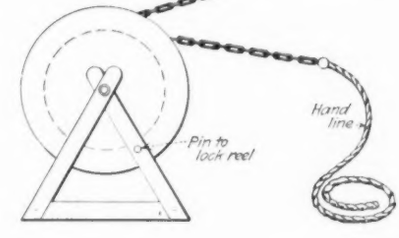
This wide variation in assumptions as to efficiency and the power function of I is introduced to show the relatively small effect on the resulting index curve and its usefulness for operating purposes. Curve 3a derived from the alternate relationship and efficiency assumption is practically as useful in operating the unit as is the first index curve 3 or the actual performance curve 5.

The typical curves are presented to show how the point of best operation of a hydro unit may be quickly and economically determined without the expense and uncertainties of measuring the discharge. Such curves enable the operating force to get out of a unit all there is in it and to check its condition as to wear or obstruction from time to time with a view to eliminating waste of kilowatt-hours.

Table III—Efficiency from Impact Gage Index

Tenths Gate	1 Force on Scale I	2 Kw. Output	2a Combined Assumed	3 Efficiency Computed
10	505	2,945	..	79.7
9	410	2,830	85	85.0
8	333	2,523	..	84.0
7	260	2,141	..	80.8
6	205	1,722	..	73.1
5	150	1,295	..	64.2
4	100	882	..	53.6
3	60	502	..	39.4
2	...	.....	..	.....
1	...	.....	..	.....
0	...	.....	..	.....

A Non-Tangle Ground Chain



GROUND chains often appear to possess an extraordinary capacity to involve themselves in hopeless tangles and knots, particularly on a cold day when it is desired to get one of them over a line in a hurry. To avoid such difficulties the Northern States Power Company provides that each chain, when not in use, be carefully wound on a reel in the manner shown in the sketch. The double winding, beginning at the middle of the chain, leaves both ends free and only as much chain is unreeled as is required by the job.

Wood Supports Increase Flashover Values

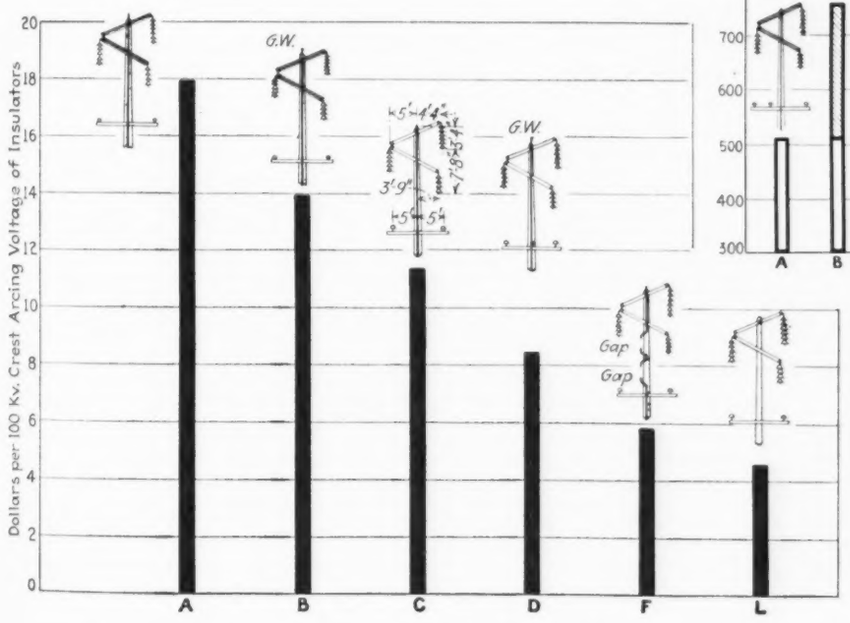
WHETHER wood or steel supports shall be used for carrying power lines is usually decided by the relative importance or permanence of the circuit in question. But A. O. Austin, chief engineer Ohio Insulator Company, has conducted investigations which indicate that an insulator will show considerably higher flashover value on wood structures than on steel or structures that include metal crossarm, bonded insulator supports, downleads, grounded guys, etc. This benefit is derived from the insulation provided by the wood. While he does not advocate that wood poles and crossarms should always be used instead of steel structures, he does maintain that this inherent insulation of wood should not be overlooked in guarding against flashovers from induced charges. Insulators should still be used to carry the full operating voltage without any reliance on the wood supports, but the latter can often be utilized to provide an additional margin of safety over that in the insulators when a transient disturbance occurs.

For example, Mr. Austin shows by the accompanying graphs, based on actual tests, that a specific insulator on a wood pole withstood more than 1,800 kv. (peak impact), whereas the same insulator on the same support with insulator supports bonded to a grounded downlead withstood only 500 kv. impact. Converting this protection to a cost basis, he also shows that the higher flashover protection is secured at 25 per cent of the unit cost of the 500 kv. protection.

Intermediate results are obtained by the intermediate conditions. The addition of a ground wire and downlead gives 800 kv. flashover, but the ground wire reduces the induced voltage sufficient to give the equivalent protection of 1,200 kv. However, Mr. Austin has shown by demonstration that wood poles can be protected against shattering if gaps are placed in the ground lead; at the same time the flashover value of the insulator is greatly increased. Likewise, gaps in the guys give added flashover value.

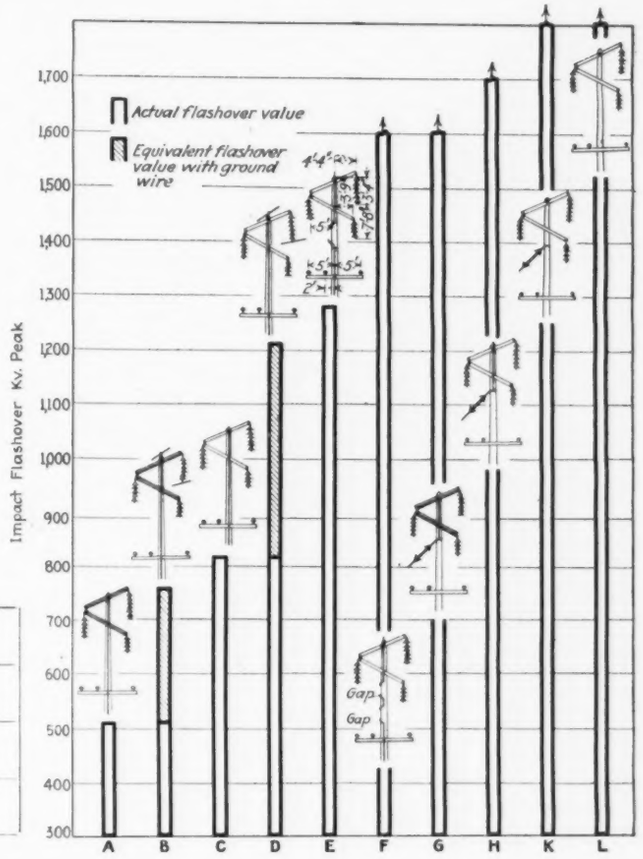
To the engineer who worries about crossarm or pole fires starting from leaking insulators, Mr. Austin says provide enough insulation so failure of a unit will not cause dangerous leakage. The engineer who wishes to secure positive action of circuit breakers when an insulator shatters or a conductor falls on the crossarm by bonding and grounding the insulator supports loses all the safety factor provided in the wood insulation.

Some engineers may contend that the possibilities of pole fires and the uncertainty of ground-relay operation existing with ungrounded crossarms offset the added flashover value obtained by wood construction, but nevertheless, advantage of the latter may be more fully utilized than it is by recognizing its importance.



Comparative Cost per Unit of Flashover Value

Ground wire is given full credit for its reduction of induced voltage. Cost includes poles, crossarms, fittings, insulators, also one span of overhead ground wire, bayonet, gaps and downlead where used. Conductor and erection labor cost not included.



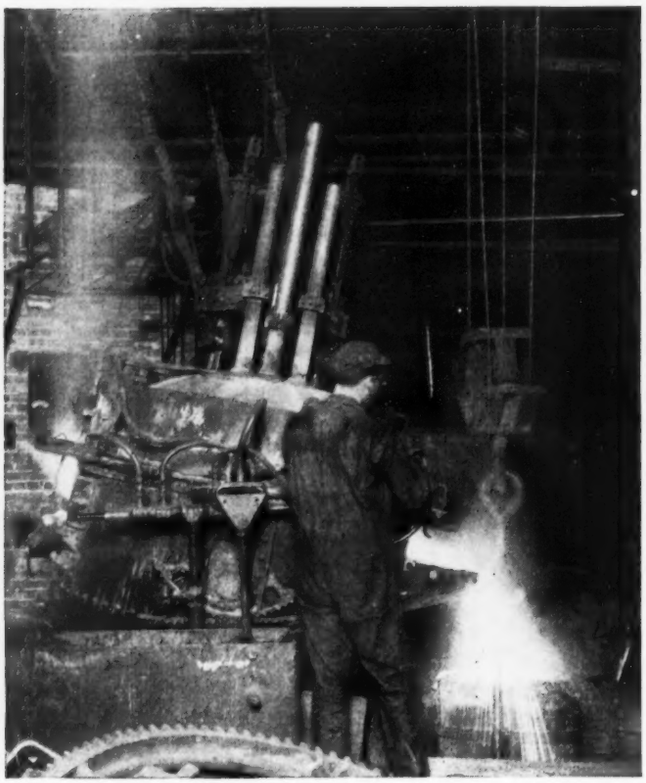
How Impact Flashover of Insulator on Wood Supports Changes with Metal Attachments to Crossarms or Pole

A, insulator supports and downlead grounded, similar to metal pole and crossarms; *B*, same as *A* but ground wire added; *C*, ground downlead but full insulation of crossarms; *D*, same as *C* but with ground wire added; *E*, same as *C* but with 32-in. gap in downlead; *F*, same as *C* but with two 30-in. gaps in downlead; *G*, pin supports and downlead at pole top attached to grounded guy through 78-in. gap; *H*, same as *G* but pin supports not metallically connected; *K*, full insulation of crossarms and pole retained but with grounded guy containing 78-in. gap; *L*, full insulation of pole and crossarms retained.

Electric Furnace Found Ideal

for High-Grade St

Casting production based on advantages of electric melting and annealing. Close control of metal analyses and treatment permits making of desired alloys



One-Half Ton 'Lectromelt Furnace Pouring Off

AN AVERAGE consumption of 1,595 kw.-hr. per ton of steel castings produced in a year, of which 1,110 kw.-hr. are for melting, 270 for annealing and the remainder for handling, for incidental power and for lighting, is shown by the operating records of the Sivyer Steel Casting Company, Milwaukee, Wis. In terms, not of castings produced, but of metal charged, which is the customary manner of statement, the average furnace performance is 625 kw.-hr. per ton. Naturally, these figures can be of only approximate value in comparison with, or in application to, other foundries, since they cover a wide range of carbon and alloy castings, in which the Sivyer company specializes. But these alloy and carbon steels are all of high grade and the data given may be taken as representative of electricity consumption when close control of quality of product is a paramount consideration.

The wide variety of carbon and alloy steel castings made in this foundry necessitates not only good working practice to secure proper analysis control and prevent alloy segregation, but also very close temperature control in the heat treatment of the resulting castings to obtain the desired physical properties. The analysis range covered by the various types of steels includes, in addition to the various carbon steels, manganese carbon, chrome, vanadium, chrome nickel and a special complex molybdenum alloy steel having exceptional properties.

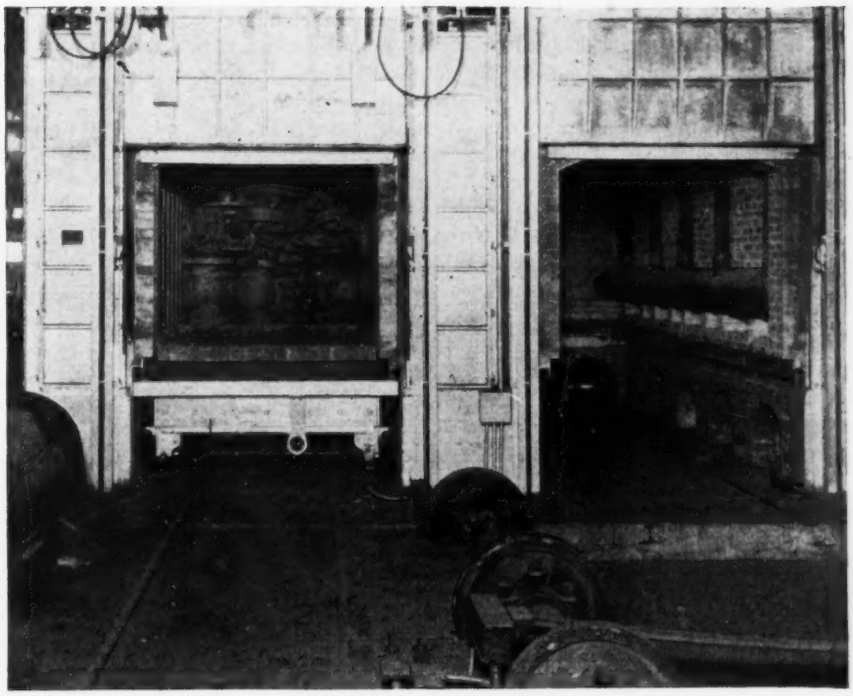
The melting units are two Moore 'Lectromelt furnaces, made by the Pittsburgh Furnace Company. The larger of these furnaces has a rated capacity of 3 tons, while the smaller is rated ½ ton. In practice, charges of 6,800 and 1,500 lb. respectively are used. Current is delivered to the plant at 13,200 volts from the system of the Milwaukee Electric Railway & Light Company and is stepped down to the required voltage by means of suitable transformers at the furnaces. The transformer for the larger furnace has a rated capacity of 1,500 kva. and is provided with taps to deliver current to the furnace at either 120 volts (high tap) or 85 volts (low tap). A special circulation system has been provided to prevent overheating of the transformer oil in those periods when the furnace is run at its capacity for a long period. The furnace is equipped with the usual regulators, with instruments to indicate the distribution of current between the three phases and with a demand meter for showing the power used at any time during the fifteen-minute period which is used as a basis for determining the demand. The small furnace has a 300-kva. transformer provided with taps to furnish voltages of 155, 130, 100 and 60 volts.

In making a heat of steel in the large furnace, the charge, which consists of steel turnings and shop scrap, is introduced into the furnace by means of charging chutes. Power is then applied at the high tap voltage of 120 volts. A definite quantity of energy limiting the amount of high tap current input has been established in the plant through a careful study of furnace reactions. During this period the charge has become molten and the slag has started to form. When the kilowatt-hour meter shows that the correct amount of energy has been used at the high voltage the potential is reduced to 85 volts and the refining action, which has started during the high tap period, is allowed to continue. This period is known as the refining period and during it the undesirable impurities, such as iron oxide or the various gases, are removed from the metal. Also, during this period a reduction of the silica of the slag to silicon occurs under the influence of the high temperature and the carbon of the electrode. This silicon then enters the metal. The refining period is continued until the metal is satisfactorily degasified and the carbon and silicon contents are within the desired range. The furnace is then switched back to high tap for a short period to increase the temperature to the desired point, at which time the metal is tapped into the pouring ladle. While the metal is be-

By D. ZUEGE

Metallurgist Sivyer Steel Casting Company, Milwaukee, Wis.

Steel Castings



A 300-Kw. Hevi-Duty Furnace Anneals the Foundry Output

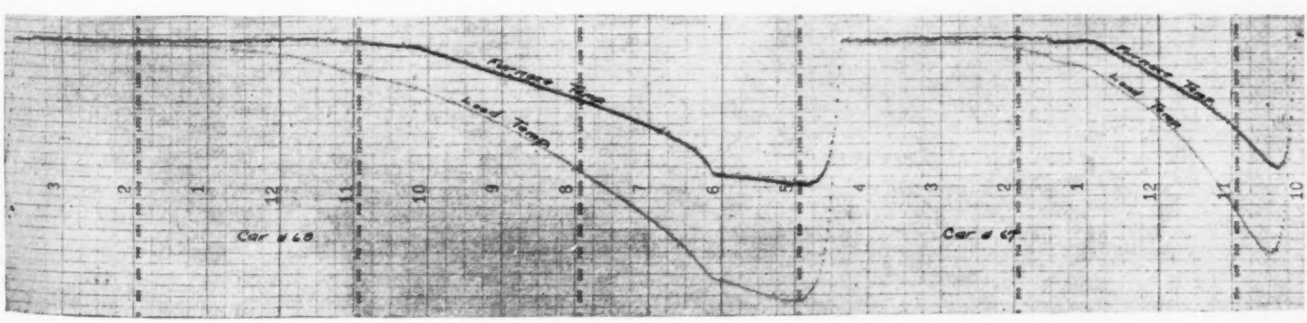
At the right is the controlled cooling chamber.

ing tapped in this manner, enough ferromanganese and a small amount of ferrosilicon are added to bring the metal to the proper analysis. Alloys may be added in the ladle also.

There is one great advantage in the flexibility of the electric furnace that is made the most of in the Sivyer foundry. This lies in the use of a small capacity furnace that can readily and quickly be turned from the production of one alloy type to another. An old adage in the industry says that the place to make steel is in the furnace. But many founders must handle small orders of the "rush" variety, which do not warrant single heats in a large furnace. A common expedient in these cases is to "dope the pot"; that is, add the alloying materials to ladles of metal drawn from a large furnace. This practice, unless most carefully used, is apt to result in castings of non-uniform analysis and metallurgical structure. The ½-ton furnace earlier mentioned permits the production in this foundry of castings of controlled high quality in small orders as well as in large.

The annealing furnace was built by the Hevi-Duty Electric Company, Milwaukee. It consists of a heating chamber and a variable rate cooling chamber. In the heating chamber elements are provided on all six sides, including car top, roof and door. The furnace is operated at 220 volts and is rated at 350 kw. However, by means of switches at the rear of the furnace, the connections may be changed from delta to star, or certain elements may be cut out entirely. In this manner a wide variety of current inputs may be obtained, as desired. For control purposes the elements are divided into front and rear zones, each being controlled by a Brown indicating controller. A two-point Brown recorder is used to record the temperature of the hottest and coldest part of the furnace which can be reached practically.

The furnace car in the 350-kw. Hevi-Duty Electric Company annealing furnace is of such size as to take two trays of castings, each 54 in. x 66 in. and about 40 in. in height. The weight of the charge will vary from 5 to 8 tons, depending upon the shape of the castings. The furnace is run on full input until the hottest point reaches the desired temperature. The power consumption will vary between 230 and 300 kw.-hr. per net ton of castings, depending upon the weight and nature of the charge. All car movements, including the transverse movement from the heating to the cooling chamber, are made electrically. This practice applies also to the raising and lowering of the doors. All movements are controlled from a central push-button control board and all electrical circuits are protected by means of limit switches which permit movements of the cars and doors only in proper sequence and when all conditions are correct.



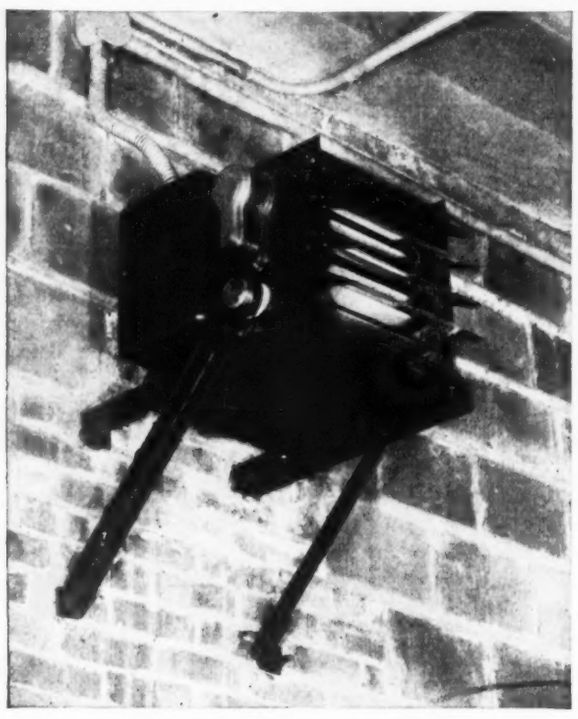
Typical Annealing Temperature Chart, Showing Two Charges

Castings may be cooled in air and then run back into the heating chamber for a draw, or they may be transferred to the cooling chamber for slow cooling. In the latter chamber cool air is drawn through the flues. By varying the amount of air going through these flues the cooling rate may be modified. The distinct advantage of this type of annealing furnace is the uniformity of temperature and excellent control which can be maintained.

The Sivyer company holds that the electric furnace has made possible the present-day developments in cast steel alloys. Its introduction opened up two avenues of ferrous metal improvement that would never have been known without it. The great flexibility of the electric furnace and the rapid metallurgical reactions that occur in it have required a distinct raising of skill in operators. These men have made great improvements, not only in the art of metal composition but in many other phases of foundry practice as well. The second avenue is a natural branch of the first. Having a better melting unit and a more competent operating staff, it was to be expected that their capacities should be explored. Many new types of alloy steels were developed, and now it is possible to make metal of many desired compositions.

Condensation in Substation Eliminated by Heater

AUTOMATIC substations in a coastal system have suffered from the condensation of atmospheric moisture in the vicinity of the control equipment. Service interruptions and poor functioning have been eliminated



Wall-Mounted Heater Stops Condensation

so far as this cause is concerned by the simple expedient of installing a 5-kw. thermostatically controlled air heater on a wall bracket as shown. Dry air circulation results and the device is located near the ceiling in space of no value for other purposes.

Electric Oil Burner Consumption and Revenue

Five Baltimore installations average 160 kw.-hr. per season. Minneapolis climate increases use 77 per cent

FIGURES on energy consumption and revenues from five oil burner installations in Baltimore were presented as a part of a committee report by the Association of Edison Illuminating Companies recently and are reproduced herewith. To show the effect of climate, the energy consumption and load factor of similar installations in nine different localities were also presented.

In general the electric consumption of a given oil burner is practically proportional to the difference between inside and outside temperatures designated as "degree-days." The five Baltimore installations averaged 160 kw.-hr. per burner per season, which at 4 cents per kilowatt-hour would produce $6.40 a year.

As will be observed from the comparison of consumption and load factor of similar installations in different cities the climate is one of the chief governing factors, as the unit consumptions in Buffalo and Minneapolis were 50 per cent and 77 per cent greater than in Baltimore.

Records on Five Typical Oil Burner Installations in Baltimore

	Total Degree-Days Normal Season for Balto.	Equiv. No. Hours Operation per Season	Equiv. Gal. Oil Consumption per Season	Equiv. Kw.-Hr. Consumption per Season	Electric Revenue per Season	Per Cent Load Factor
Install. No. 1	4,500	968	2,313	212	$8.48	11.5
Install. No. 2	4,500	761	1,811	193	7.72	8.7
Install. No. 3	4,500	729	2,194	168	6.72	8.3
Install. No. 5	4,500	1,230	1,722	137	5.48	14.0
Install. No. 6	4,500	827	1,935	93	3.72	9.5

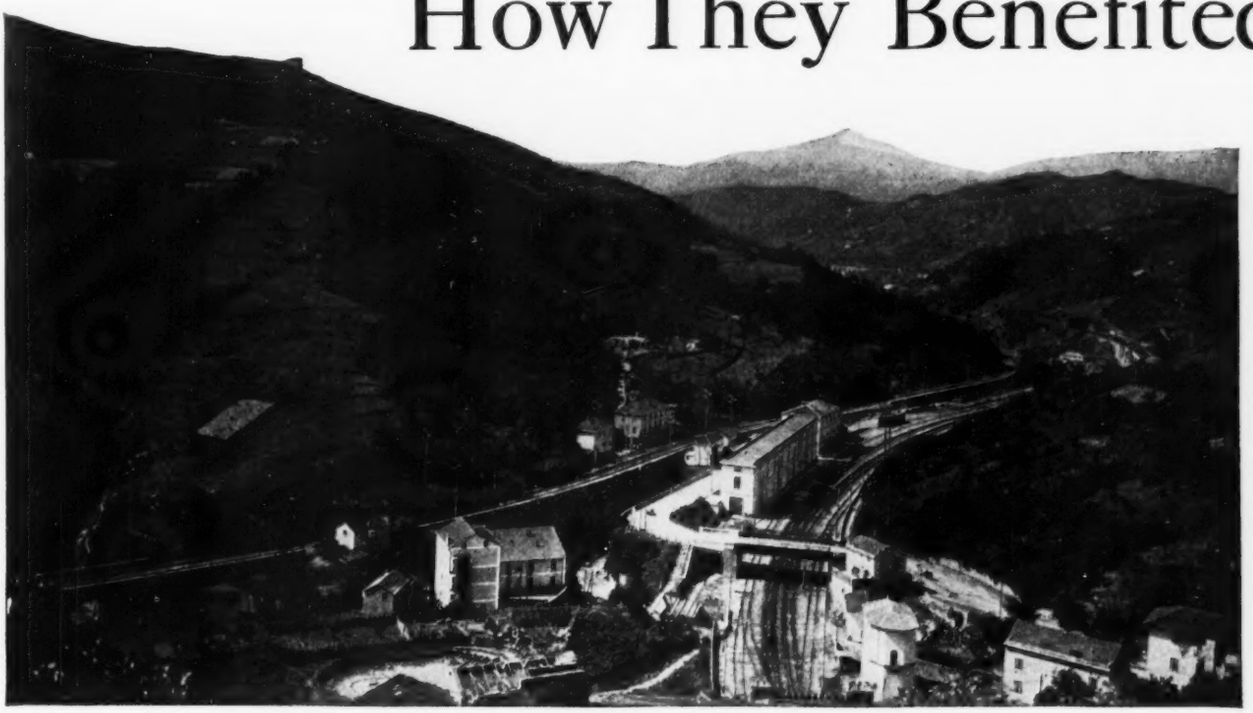
Month	Install. No. 1 Kw.-Hr.		Install. No. 2 Kw.-Hr.		Install. No. 3 Kw.-Hr.		Install. No. 5 Kw.-Hr.		Install. No. 6 Kw.-Hr.		Total Kw.-Hr.	
Oct.	11	$0.44	10	$0.40	9	$0.36	7	$0.28	5	$0.20	42	$1.68
Nov.	28	1.12	26	1.04	22	0.88	18	0.72	12	0.48	106	4.24
Dec.	40	1.60	36	1.44	31	1.24	25	1.00	17	0.68	149	5.96
Jan.	45	1.80	41	1.64	36	1.44	29	1.16	20	0.80	171	6.84
Feb.	39	1.56	35	1.40	31	1.24	25	1.00	17	0.68	147	5.88
Mar.	29	1.16	26	1.04	23	0.92	19	0.76	13	0.52	110	4.40
April	16	0.64	15	0.60	13	0.52	11	0.44	7	0.28	62	2.48
May	4	0.16	4	0.16	3	0.12	3	0.12	2	0.08	16	0.64
Total	212	$8.48	193	$7.72	168	$6.72	137	$5.48	93	$3.72	803	$32.12

Installations Nos. 1, 2, and 3 represent the more expensive, higher current-consuming type burners employing the use of motor drive for blower and pressure pump, and the use of electric ignition, Nos. 1 and 2 using continuous ignition, and No. 3 intermittent ignition. Installations Nos. 5 and 6 represent the less expensive, gravity feed, smaller current-consuming, rotary type burners, employing the use of motor drive for a centrifugal atomizer, and normally equipped for gas ignition.

Effect of Climate on Similar Oil Burner Installations

Location	Degree-Days	Equivalent Single Burner Operation Kw.-Hr.	Load Factor (Per Cent)
Atlanta	2,880	107	5.3
San Francisco	3,450	129	6.4
Baltimore	4,500	168	8.3
Philadelphia	4,950	185	9.1
Seattle	5,156	195	9.5
Chicago	6,007	224	11.1
Detroit	6,202	232	11.4
Buffalo	6,750	252	12.5
Minneapolis	7,953	297	14.7

Why 20 Railroads Electrified— How They Benefited



Electrified Italian State Railways Ascending from Genoa

Features of fourteen purchased power contracts compared. Unit energy consumption for freight and passenger service tabulated

RESULTS of a world-wide survey of steam railroad electrification have just recently been made available by the National Electric Light Association, the information from which should be of great value to any one interested in the subject. Of outstanding importance are the tabular analysis of all the electrifications reported (86) and the analysis of contracts that apply to electrifications in this country. These features are presented in abbreviated form here, the reader being referred to N.E.L.A. Serial Report No. 289-118 for greater details, such as the characteristics of foreign electrifications. A recommended form in which contracts should be presented is another valuable part of the report.

It is interesting to observe that the United States had at the end of 1928 a total of 1,866 route-miles and 4,281 track-miles of electrified steam railroad. Without making allowance for the figures not reported, this country already uses about 1,625,000,000 kw.-hr. yearly for operating electrified railroads. The division between purchased power and generated power is about equal in this country, whereas purchased power constitutes only 35 per cent of the total used for this purpose elsewhere, based on the incomplete reports received.

Several types of power are used in the United States, but the Chicago, Milwaukee & St. Paul Railroad, which has more than 20 per cent of the track mileage, uses 3,000 volts d.c. and the New York, New Haven & Hartford Railroad, which ranks next in mileage, employs chiefly 11,000 volts, 25 cycles. The Pennsylvania Railroad is adopting a similar voltage, whereas the Illinois Central Railroad uses 1,500 volts d.c. The reasons for electrifying and results of doing so are particularly interesting. Of the twenty railroads in the United States, fifteen reported that they electrified largely to increase traffic facilities, ten being more specific and citing negotiation of heavy grades in three cases, increased speed in one case, improved suburban service in two cases and facilitating terminal operations in four cases. Next in importance to increased capacity, so far as number reporting, came elimination of smoke in tunnels. Three others cited general elimination of smoke in congested centers.

Only four embarked on electrification to reduce operating costs. However, when it comes to analyzing the benefits derived, eleven definitely report reduced operating expense and one fewer scheduled cars and trains. Eleven experienced a general increase in carrying capacity, two reduced headway, one increased tonnage per train, one increased terminal capacity and one less delays. Better patronage, increased revenue and valuable air rights are other benefits cited.

Outside the United States similar benefits and reasons are given for electrifying, but emphasis is placed on the influence of tunnels and grades. Use of water power and scarcity of coal are other reasons not given in the United States. The Canadian National Railroad reports a 100 per cent increase in capacity, while the Spanish Northern Railroad reports three times its former capacity. The Bethlehem Chile Railroad reports a greatly reduced cost per ton-mile.

In a table (not reproduced here) covering character-

Table I—Condensed Analysis of Electrified Steam Railroads

Name of Railroad	Location of Electrification	Electric Mileage		System of Electrification Installed		Year Electrified	Traffic Affected *	Reasons for Electrification	Results of Electrification
		Route	All Track	Volts	Cycles				
1 Baltimore & Ohio Railroad	Baltimore Tunnel	3.60	9.06	675	D.C.	1895	F. and P.	Eliminate smoke in tunnel	Capacity increased; operating costs lowered; smoke eliminated.
	Staten Island Lines	28.00	50.00	600	D.C.	1925	S. P.	Legislation; tunnel operation; terminal switching	Facilities increased; operating economies.
2 Boston & Maine Railroad	Hoosac Tunnel	7.92	21.38	11,000	25	1911	F. and P.	Increase capacity; eliminate smoke in tunnel	Tunnel operation facilitated; capacity increased.
3 Boston, Revere Beach & Lynn Railroad	East Boston, Lynn and Winthrop	13.80	31.00	650	D.C.	1928	S. P.	Reduce operating costs; increase efficiency of service	Reduction of headway; use of fewer scheduled cars.
4 Butte, Anaconda & Pacific Railway	Butte, Anaconda, Rocker	37.38	122.75	2,400	D.C.	1913	F. and P.	Increase capacity; general economy	Fewer trains, fewer delays; increased tons per train, annual saving.
5 Chic., Milwaukee, St. Paul & Pac. R.R.	Harlowton, Mont.—Avery, Idaho	440.10	578.02	3,000	D.C.	1915–1916	F. and P.	General economy; increase capacity; heavy grades; tunnels	Capacity increased; traffic increased; operating economies.
	Othello, Tacoma and Seattle, Wash	218.41	305.38	3,000	D.C.	1919–1920	F. and P.	General economy; increase capacity; heavy grades; tunnels	Capacity increased; traffic increased; operating economies.
	Great Falls Yard	0.00	6.20	1,500	D.C.	1915	F. S.		
6 Delaware, Lack. & Western R. R.	Brooklyn Freight Terminal	0.00	1.08	600	D.C.	1926	F. S.	City ordinance; eliminate smoke.	Smoke eliminated.
7 Detroit, Toledo & Ironton R. R.	Fordson, Flat Rock, Mich	16.58	50.05	22,000	25	1926	F.	Increase facilities; eliminate smoke; Detroit city ordinance	Smoke eliminated; efficiency increased.
8 Erie Railroad	Rochester, Mt. Morris, N. Y.	34.00	38.00	11,000	25	1907	P.	Increase capacity	Capacity and facilities increased; economy.
9 Ft. Dodge, Des Moines & So. R. R.	Ft. Dodge, Des Moines, Rockwell, Iowa	146.60	195.03	1,200	D.C.	1906–1912	F. and P.	Increase facilities, reduce operating cost	Operating costs reduced; facilities increased.
10 Great Northern Railway	Skykomish, Wenatchee, Wash	72.80	87.50	11,500	25	1927–1929	F. and P.	Decrease operating costs; eliminate smoke in tunnel; increase speed of trains	
11 Illinois Central Railroad	Chicago—Richton, Ill., and branches	37.80	127.10	1,500	D.C.	1926	S. P.	Increase facilities; eliminate smoke; agreement with Chicago	Higher speed; more trains accommodated; increased patronage.
12 Long Island Railroad	New York to western Long Island	122.82	364.95	650	D.C.	1905–1926	F. and P.	Improve suburban service; facilitate terminal operation; tunnels; legislation	Smoke eliminated; facilities increased; faster service.
	Bay Ridge, Fresh Pond Junc., N. Y.	11.93	84.43	11,000	25	1927	F.	To facilitate through freight operation with N.Y., N.H.&H.R.R.; also legislative req'ment	Smoke eliminated; economies in handling through traffic.
13 Michigan Central Railroad	Detroit—Windsor	4.51	28.55	650	D.C.	1910	F. and P.	Eliminate smoke in tunnel	Capacity and speed improved; operating economies.
14 New York Central Railroad	New York, Croton, White Plains and branches	63.10	328.32	650	D.C.	1906–1926	P.	Operation through tunnel; improve service; increase facilities	Smoke eliminated; capacity increased; air rights developed.
15 N. Y N. H. & Hartford R. R.	Nantasket Jc. to Pemberton, Mass	6.87	16.61	650	D.C.	1895	P.	Increase traffic by improved service	Service improved and traffic increased.
	Providence, Warren, Bristol, Fall River	23.91	48.50	650	D.C.	1901	P.	Increase traffic by improved service	Service improved.
	New York to Woodlawn	11.95	48.71	650	D.C.	1907	P.	Legislation prohibiting steam operation in tunnel; terminal operation; increase facilities	Facilities increased.
	Woodlawn, N. Y., to New Haven, Conn., including Harlem River Branch	75.22	509.88	11,000	25	1907–1914	F. and P.	Increase facilities; general economy	Facilities increased.
	Stamford to New Canaan, Conn.	7.92	9.78	11,000	25	1908	F. and P.	Increase facilities; general economy	Facilities increased.
	South Norwalk to Danbury, Conn	23.72	31.01	11,000	25	1925	F. and P.	Increase facilities; general economy	Facilities increased.
	Port Morris to Fresh Pond and Sunnyside Yards; N. Y.	9.00	25.80	11,000	25	1918–1927	F. and P.	Increase facilities; general economy	Facilities increased.
16 New York, Westchester & Boston Ry	Bronx, Rye, White Plains, N. Y.	23.44	67.50	11,000	25	1912	S. P.	Increase facilities	
17 Norfolk & Western Railway	Bluefield—Iaeger, W. Va., and branches	63.70	209.54	11,000	25	1915–1925	H. F.	Grades; tunnels; increase capacity	Capacity increased; operating economies
18 Pennsylvania Railroad	Camden—Atlantic City, N. J.	75.00	150.38	650	D.C.	1906	P.	Increase traffic by improved service and facilities	Revenue increased by increased traffic; operating economies.
	New York—Manhattan Transfer	13.41	110.08	675	D.C.	1910	P.	Legislation; tunnel; new terminal in New York	
	Philadelphia, Paoli, Chestnut Hill, Pa.	36.16	125.15	11,000	25	1915–1924	F. and P.	Suburban traffic, congested terminal	Terminal capacity increased.
	Philadelphia, W. Chester, Pa.—Wilmington, Del	52.60	150.06	11,000	25	1928	S. P.	Suburban traffic; congested terminal	Terminal capacity increased.
19 Southern Pacific Railroad	Oakland, Alameda, Berkeley, Calif	50.03	118.85	1,200	D.C.	1911	P.	Increase facilities; eliminate smoke	
20 Virginian Railway	Mullens, W. Va.—Roanoke, Va	134.00	231.00	11,000	25	1925	H. F.	Increase capacity; heavy grades, tunnels	Increase capacity; reduced fuel and operating costs.

*F = Freight. P = Passengers. S = Suburban. H = Heavy.

istics of tunnels, ruling grades and largest locomotives, it is pointed out that the Chicago, Milwaukee & St. Paul Railroad has 46,227 ft. of tunnels, the Great Northern 48,342 ft. and the Boston & Maine 25,080 ft., which influenced electrification. The Chicago, Milwaukee & St. Paul had 216,480 ft. of ruling grade against heaviest traffic, while the Virginian Railway had 63,360 ft.

All except six of the twenty United States railroads purchase all their power, these six generating slightly more than is purchased by all twenty. Calculated in kilowatt-hours per car-mile, the Providence-Fall River division of the New York, New Haven & Hartford uses the most for passenger trains, 7.46, whereas the Rocky Mountain division of the Chicago, Milwaukee & St. Paul

How Fourteen Electrification Contracts Differ

Term.—Ranges from three to 99 years; ten years most frequent (six cases).

Renewal.—Mostly renewable except those for long periods; six are perpetually renewable by terms of one to five years each; usually require twelve to 24 months' notice of intention to terminate, although two small ones do not require more than 30 days.

Increase of Capacity.—Capacity, where not definitely limited, may usually be increased on twelve-month notice during early years of contract, or later if renewal or extension is agreed.

Place of Delivery.—Nine at railroad substations, three at power company generating stations, two at power company substations.

Form of Energy.—Eight contracts for three-phase energy at 60 cycles and voltages from 11,000 to 100,000; four contracts for three-phase energy at 25 cycles and 11,000 or 13,000 volts (one also includes single-phase energy); one contract for 1,500-volt direct current.

Metering.—Considerable uniformity; similar to large industrial power customers.

Unbalance.—One contract limits to 10 per cent.

Strike, Riot, Etc.—Demand charges and guarantees are usually suspended and the railroad pays an energy charge alone during the continuance of calamity.

Interruption of Supply.—Securing compliance through power of cancellation. One provides a cash rebate for long interruptions (over fifteen minutes per day) and another provides for adjustment of demand and guarantee.

Change of Rate.—Four contracts protect the railroad against lower rates to other customers for similar service. Five provide for increase or decrease subject to state authority. (In one of the latter, railroad may withdraw if rate is increased.) In one contract a reduction of rate is provided in case of certain growth of the railroad's electrical requirements.

Form of Rate.—Ten contracts have Hopkinson (or two-charge) form. Four are straight-line rates. Of the ten Hopkinson rates, two are the simplest form with single demand and energy charges. Eight have the demand and energy charges (either or both) in blocks, and two of the eight use the Wright (or load-factor) principle in blocking the energy charge.

Two of the straight-line rates involve measurements of demand, as one adjusts the rate according to load factor and the other adjusts the guranteed consumption. The two remaining straight-line rates base the guaranteed consumption on the contract capacity.

Demand Interval.—Twelve contracts require the measurement of demand, daily or monthly. Seven use a 60-minute (sometimes clock-hour) period, two use 30 minutes and three use five minutes. Several specify that no demand registered immediately after an interruption of service shall be considered in billing.

The Billing Demand.—In case of the 60-minute demands, two use the one highest only, three make an average of three demands, one makes an average of six and one averages all the daily demands in the month.

In case of the 30-minute demands, one uses the single highest of the month and the other makes an average of twenty demands.

In case of the five-minute demands, two use an average of three and one uses an average of all the daily demands in the month.

Period to Which the Billing Demand Applies.—Seven contracts use the actual measured or calculated demand each month. Three of these do not allow the billing demand to recede below 70 per cent of its highest value in the previous twelve months, or 75 per cent of the highest value attained during the previous life of the contract.

Four contracts make each successive highest monthly demand effective for billing during twelve months, and one retains the highest monthly demand for the remaining life of the contract.

Minimum Charge or Bill.—Most of the contracts start with a fixed amount based on demand or consumption or both, followed by increases based on actual use.

The ten contracts with rates of Hopkinson form base the continuing minimum charge as follows: Two on a specified number of kilowatts, two on the established demand, four on the established demand and a guaranteed load factor, one on the miles of line electrified.

The four contracts with straight-line rates base the minimum charge as follows: Three on guaranteed capacity factor, and one on demand plus a guaranteed load factor.

Energy Demand or Eenergy.—Eight contracts provide for excess service on account of extraordinary operating conditions, usually subject to power company's ability to supply the excess and specifying some previous notice. Three specify the length of time during which excess power may be taken, varying from 24 hours to one week. Two limit the occurrence to three times per year. One limits the taking to double the established demand. During periods of excess demand the guarantees are usually waived and ordinary energy charge prevails.

Power Factor.—Eight contracts provide that the power factor (particularly at times of heaviest demand) shall not go below certain standards as follows: One limits to 75 per cent, three to 80 per cent, three to 90 per cent and one to 95 per cent. Four of the eight impose penalties for low power factor by correcting the demand proportionately.

Fuel Clause.—Ten contracts provide for adjustment of the rate according to the cost of coal, usually by adjustment of the energy charge. There are five general types of this adjustment: One contract adjusts monthly according to the cost per B.t.u., five adjust monthly according to the cost per ton, two adjust quarterly according to the cost per B.t.u., one adjusts quarterly according to the cost per ton, and one adjusts annually according to the cost per B.t.u.

Cancellation.—Eight contracts provide cancellation as a penalty for non-performance. In one case the power company may cancel for default in payment, in four cases the railroad may cancel on account of poor service and in three cases either party may cancel for the respective reasons just stated.

Special Provisions.—Among the special provisions of interest in the various contracts are:

1. Power company assumes operation of railway's generating station with option to purchase.
2. Railway may enter and operate power company's generating station in case of necessity.
3. Space for substations and transmission lines provided free by railroad (or at nominal rental). Power company may use such space for any purpose incidental to its business, either without charge or with charge based on proportion of non-railway business.
4. On expiration of contract railroad shall purchase equipment installed for its exclusive use by power company and not over fifteen years old.
5. Railroad may terminate contract by purchasing power company's special facilities for its particular service.
6. Power company may rent space for communication circuits on railroad's pole lines.
7. Either party may install equipment in station or substation belonging to the other.
8. Either party at manually operated station or substation will operate equipment of the other without labor charge.
9. Power company will maintain electrical equipment, and transmission or distribution lines, of railroad company, at cost.
10. Railroad may use energy for all purposes incidental to its business and supply these needs at various locations by its own transmission or distribution lines.
11. Railroad may supply energy to subsidiary and related companies.
12. Railroad may supply energy to other railroads for train operation when such operation is conducted electrically over the first road.
13. In event that railroad company extends its electrification into the territory of another power company, the first power company agrees to make a reciprocal contract, with the second power company, for emergency transfer of energy.

uses the least, 2.37. Based on the unit of 1,000 ton-miles of freight service (gross), the Norfolk & Western uses the most energy, 90 kw.-hr., and the Rocky Mountain division of the Chicago, Milwaukee & St. Paul the least, 24.35.

A large part of the report is devoted to recent progress and features of existing developments here and abroad, but is not reproduced here.

As previously mentioned, the analysis of contracts that apply to railroads in this country is particularly interesting. As the committee reports:

"There is considerable variation in the terms and conditions of these contracts and a necessity for clarity of expression. Greatly to simplify and standardize the terms and conditions, it is recommended that the problem be approached with a broad point of view, knowing that in the long run difficult terms, and conditions that are only irritating, will be either ignored or modified.

"As the electrified zones expand and spread into the territories of additional power companies there will be a distinct advantage in having similar agreements, similar contracts and relationships, and, in a word, analogous operating conditions in adjacent portions of the railway systems. Without doubt the power companies may find it advisable, or even necessary, to interchange energy for railroad purposes, or, as it might be expressed, to pool their facilities along extensive electrifications. This then, will require a certain similarity of contractual relations.

"It should be plainly stated that the price paid for energy is only one feature of the contract, although admittedly of utmost importance. The contract form can be discussed and planned quite independent of the price. In fact, a properly designed contract form may be used in one part of the country with certain prices inserted in the rate section, and may be used elsewhere with other prices inserted in the rate section to meet different conditions in the cost of producing or supplying electrical energy. In the interest of standardization, however, the rate form, like the remainder of the contract, should be shaped to a standard expression requiring only the substitution of proper, adequate prices depending upon local conditions.

"When general acceptance is accorded by both railway and power industries to the principle of standardizing, so far as possible, the terms and conditions of large power contracts, it is the opinion of this subcommittee that a great deal will have been accomplished toward better mutual understanding.* There are, however, certain basic features of contract designing, certain inherent features of the power business and other inherent features of the railway business that are fairly universal and well known. These should be recognized in any contract, and then should be supplemented (but, if possible, not altered) by such provisions as adapt the whole to the specific locality where the contract will be applied."

As an indication of the attitude of the railroads toward this matter, it may be stated that associations of railway engineers and executives are now engaged in studying the essentials of a standard power contract.

Table III—Density of Population and Railroads in United States and Europe

Country	Area in Square Miles	Population	Pop. per Sq. Mi.	Route Miles of All Rys.	Ry. Mi. per 1,000 Sq. Mi.	Ry. Mi. per 10,000 Pop.	Route Miles of Govt. Rys.
	a	b	b/a	c	c/a	e/b	d
Austria	32,368	6,535,363	201.91	4,128	127.53	6.32	3,608
Czechoslovakia	54,206	14,388,000	265.43	8,289	152.98	5.76	2,289
France	212,736	40,960,000	192.54	26,872	126.32	6.56	6,907
Germany	180,972	62,592,575	345.87	35,597	196.70	5.69	33,320
Italy	119,744	40,799,000	340.72	13,355	111.53	3.27	10,300
Netherlands	13,213	7,626,072	577.16	2,254	170.58	2.96	.....
Spain	195,040	22,128,000	113.45	9,705	49.76	4.38	.....
Sweden	158,525	6,087,923	38.40	10,110	63.77	16.61	3,877
Switzerland	15,944	3,959,000	248.31	3,492	219.02	8.82	1,828
*United Kingdom	94,278	44,170,241	468.51	21,165	224.50	4.79	.....
United States	2,973,774	120,013,000	40.36	249,131	83.78	20.76	.....

*Includes England, Scotland, Wales and Northern Ireland.

Table II—Operating Characteristics of Electrified Sections of Steam Railroads

Name of Railroad	Average No. Trains Daily Passenger	Average No. Trains Daily Freight	Car-Miles in Year Passenger Train	Car-Miles in Year Freight Train	Energy Supplied (Kw.-Hr.) Generated	Energy Supplied (Kw.-Hr.) Purchased	Energy Used (Kw.-Hr.) Per Passenger Train Car-Mile	Energy Used (Kw.-Hr.) Per Freight Train Car-Mile	Energy Used (Kw.-Hr.) Per 1,000 Gross Ton-Miles of Freight Service
1 Baltimore & Ohio Railroad									
Baltimore Tunnel	13	21	142,590	1,297,900	.....	7,360,840			
Staten Island Lines	466	..	2,843,068	.....	.....	16,495,796	3.31	.....	.....
2 Boston & Maine Railroad	12	28	215,172	3,868,065	.....	7,467,890	5.25	1.58	34.98
3 Boston, Revere Beach & Lynn R.R.	272	..	2,670,000	.....	.....	1,466,800	.....	.....	.....
4 Butte, Anaconda & Pac. Railway	4	6	117,457	5,079,040	.....	19,315,384	.....	3.72	69.90
5 Chicago, Milwaukee, St. Paul & Pacific R.R.:									
Rocky Mountain Division	4	..	6,553,898	52,190,990	.....	113,436,311	2.37	0.93	24.35
Coast Division	4	..	3,810,520	15,810,893	.....	48,838,098	2.34	1.16	30.87
6 Delaware, Lack. & Western R.R.	.....	.....	.....	.....	.....	56,210	.....	.....	.....
7 Detroit, Toledo & Ironton Railroad	.....	8	.....	.....	.....	.....	.....	.....	.....
8 Erie Railroad	20	..	535,000	.....	.....	2,395,800	4.03	.....	.....
9 Fort Dodge, Des Moines & So. R.R.	8	12	275,000	2,585,657	.....	.....	.....	.....	.....
10 Great Northern Railway	8	4	.....	.....	.....	.....	.....	.....	.....
11 Illinois Central Railroad	552	..	10,814,046	.....	.....	60,607,807	5.00	.....	.....
12 Long Island Railroad:									
Suburban District	895	8	42,914,621	.....	.....	203,302,760	4.41	.....	.....
Bay Ridge Division	.....	30	.....	.....	.....	9,168,775	.....	.....	.....
13 Michigan Central Railroad	38	47	474,530	1,728,084	.....	12,065,900	.....	.....	.....
14 New York Central Railroad	505	45	23,391,989	.....	186,448,185	43,555,000	.....	.....	.....
15 N.Y., N.H. & Hartford Railroad:									
New York to Woodlawn	172	..	5,627,259	.....	.....	22,275,984	2.86	.....	.....
Woodlawn to New Haven, incl. Harlem River Branch	190	44	24,523,377	53,000,000	123,192,000	75,894,000	4.02	0.94	30.40
Port Morris to Fresh Pond & Sunnyside Yards	18	21	350,000	9,149,807	.....	8,329,632	.....	1.04	28.50
Providence to Fall River	42	..	702,382	.....	.....	5,234,050	7.46	.....	.....
Nantasket Jct. to Pemberton	36	.....	.....	.....	.....	375,000	.....	.....	.....
16 New York, Westchester & Boston Ry.	248	2	3,500,000	20,000	.....	21,028,191	6.00	.....	.....
17 Norfolk & Western Railway	.....	34	.....	.....	78,714,311	.....	.....	.....	90.00
18 Pennsylvania Railroad:									
Camden to Atlantic City	48	..	3,310,533	.....	.....	35,148,900	4.71	.....	.....
New York Terminal	200	..	.....	.....	296,890,210	36,147,000	.....	.....	.....
Philadelphia, Wilmington & West Chester	75	..	615,580	.....	.....	5,139,670	.....	.....	.....
Philadelphia, Paoli & Chestnut Hill	172	..	4,253,055	.....	.....	49,490,591	7.30	.....	.....
19 Southern Pacific Railroad	780	..	4,022,617	.....	27,803,200	.....	5.40	.....	.....
20 Virginian Railway	.....	19	.....	29,120,883	104,636,000	.....	.....	3.30	56.20

Market Break No Menace *to Business Prosperity*

Leading bankers and economists find crash of speculative market necessary for adjustment, but believe business conditions essentially sound

THERE is no fundamental reason why the stock market break should be reflected in business to any marked degree, in the opinion of leading economists and bankers. It has been suggested, in fact, that funds formerly used for speculative purposes will be made available to business and industry.

The answer to any question which might arise in the public mind as to the stability of the utility industry is found in current earnings statements of the operating companies. Net revenue of twenty companies increased 11.1 per cent for the year just ended. This is higher than the average yearly increase over the past decade. Energy sales are up correspondingly. The growth in net revenue is well over that of gross, indicating that operating costs have been further reduced.

The drop of as much as 100 points in market quotations of some of the leaders thus does not reflect any unsound condition in the power and light industry. It was due to a purely technical market condition which affected all market groups alike, if to a varying degree. While many of the utility leaders did not sell down to the year's low levels, the group can certainly no longer be regarded as overextended. The movement was in this respect a healthy one.

A significant by-product of the recent market situation, low money rates, combined with the stock price decline, is acting as a stimulus to the bond market. For the past three or four weeks bond prices have been steadily rising, virtually reversing a situation which has existed since early in 1928.

Approached for their opinion on this situation, an economist and a banker made the following statements:

JOHN T. MADDEN

Dean School of Commerce, New York University

The collapse in the stock market culminating October 29 was to be anticipated and may be ascribed primarily to overspeculation. The withdrawal of funds and the selling of securities here by foreigners, as well as the selling of securities by strong investors and investment trusts, put the market in a weak technical position. The evidence of this selling may be found in the fact that, in spite of declining stock prices, brokers' loans were increasing. While at the present time there seems to be some recession in business activity, this too was anticipated, because after the long period of prosperity which continued from the end of 1927 to the middle of July, 1929, business activities were expected to moderate somewhat. This decline, however is only seasonal and was advanced by the high rates of interest prevailing throughout the world.

Twenty Representative Utility Systems Show Normal Growth

	1929	1928	Per Cent Increase
North American Co. (Sept. 30)			
Gross earnings	$145,624,061	$130,668,369	11.5
Net earnings	69,777,334	62,945,278	10.9
Public Service Corp. of New Jersey (Sept. 30)			
Gross	134,078,720	122,966,908	9.0
Net	40,758,377	35,053,925	16.3
American Water Works & Elec. (Aug. 31)			
Gross	52,883,285	50,134,315	5.5
Net	26,171,612	24,029,820	8.9
Cities Service Co. (Aug. 31)			
Gross	39,885,689	33,450,189	10.6
Net	38,657,916	32,315,254	10.6
Commonwealth & Southern (Aug. 31)			
Gross	145,464,771	132,891,824	9.4
Net	74,416,922	65,834,967	13.0
Electric Pwr. & Lt. (June 30)			
Gross	57,385,076	53,550,186	7.2
Net	27,569,880	24,275,510	13.6
Standard Gas & Elec. (Aug. 31)			
Gross	151,844,762	145,023,720	4.7
Net	72,625,169	65,460,675	11.0
Central States Elec. (Sept. 30)			
Gross	27,166,601	23,917,699	13.5
Net	8,410,324	7,110,355	18.2
Detroit Edison Co. (Sept. 30)			
Gross	56,272,787	50,674,704	11.0
Net	19,339,288	17,423,103	11.0
Rochester Gas & Elec. (Sept. 30)			
Gross	14,468,158	13,345,985	8.4
Net	5,761,176	5,129,999	12.4

	1929	1928	Per Cent Increase
Consumers Power Co. (Sept. 30)			
Gross	33,161,727	29,338,980	13.0
Net	16,843,510	14,641,257	15.1
Tennessee Elec. Pwr. (Sept. 30)			
Gross	14,262,572	13,154,672	8.4
Net	6,953,330	6,214,063	11.9
Commonwealth Edison (Sept. 30)			
Gross	81,752,911	75,656,369	8.0
Net	15,659,389	15,274,914	2.5
Oklahoma Gas & Elec. (Aug. 31)			
Gross	13,575,669	11,659,867	16.4
Net	6,471,256	5,463,873	18.3
Mountain States Power (Aug. 31)			
Gross	2,999,112	2,736,510	9.6
Net	1,162,658	1,055,339	10.1
Utica Gas & Elec. (Sept. 30)			
Gross	5,180,918	4,842,475	7.0
Net	1,206,693	1,160,621	3.9
Southern Calif. Edison (9 mo. ended Sept. 30)			
Gross	29,974,360	26,280,356	14.0
Net	20,216,519	17,761,814	14.0
Kansas City Pwr. & Lt. (Sept. 30)			
Gross	14,430,653	13,550,334	6.5
Net	5,680,375	5,268,061	7.8
National Power & Lt. (June 30)			
Gross	80,560,029	77,733,991	3.6
Net	35,979,816	33,657,322	6.9
Louisville Gas & Elec. (Aug. 31)			
Gross	10,093,367	9,518,525	6.0
Net	5,212,029	4,921,986	5.9

At the present time all indications are that interest rates will decline, and one may safely predict that before this year is over interest rates will be at a much lower level than at the present time. A decline in interest rates will not only stimulate the exportation of capital from the United States, thereby tending to improve the American export trade, but will also act as a great stimulus to industry and trade as a whole. Many projects which have been delayed because of the high rate of interest prevailing will again be resumed, and in all likelihood the building industry will benefit from the decline in interest rates.

The public utilities in the United States seem to be in a sound position. The mergers which have been going on during the past year have greatly increased their efficiency, have decreased the overhead cost, have made it possible for the larger units to obtain funds at a low rate, and through the increase in efficiency the ultimate consumer will greatly benefit. An anticipated decline in interest rates will also help this industry to complete the necessary mergers and to establish the necessary improvements.

Business conditions throughout the United States are sound. With the high standard of living in the United States and with the increase in efficiency in production there seems to be no danger that the industrial or commercial structure of the country should be disturbed. The credit position throughout the country is sound. The Federal Reserve Banks are in a very strong position and, with the lowering of the discount rate, which may be anticipated almost daily, this will have a beneficial effect throughout the country. The fact that the break in the stock market coincided with the period when the business cycle tended somewhat downward led many to lay too much emphasis on the downward swing in business activity. This, however, is only temporary and irrespective of the movement of the stock exchange prices the country as a whole faces prosperous years.

The purchasing power of the farmer, to say the least, is just as good as last year or during the preceding year. Wages are maintained at a high level and unemployment is not large. With all these fundamental factors as they are, there is no reason to worry about the future. It is true that the break in stock exchange prices has caused losses to many, but it is equally true that many business men who hitherto instead of watching their business watched the ticker will again pay more attention to their business and will endeavor to find new outlets for their commodities.

To sum up, the industrial, commercial and credit position of the country is sound and the break in the stock market will have only little, if any, effect on the future developments.

H. M. ADDINSELL

Vice-President Harris, Forbes & Company

The violent break in prices that the public utility stocks have suffered, in common with practically all other stocks, in my judgment in no way reflects on the intrinsic soundness of the public utility situation in the United States. In magnitude ranking with the leading industries of the country, electrical, gas, telephone and water companies continue to render services indispensable to modern civilization—the business of these natural monopolies continues to grow at an even faster rate than our population—a steady, dependable year-after-year growth.

These services obviously afford one of the soundest bases in existence for safe investment. In general, the position of senior securities of such companies is unquestioned. Obviously their equity securities, in view of the foregoing, and the steady concentration of these companies into larger units carry a speculative appeal, and during the great bull movement in stocks in general they were carried along with the tide to levels in many cases that, to put it mildly, discounted the future for a long while. To say whether the recent deflation has carried any stocks as a class too low would be difficult, but it would appear that in many cases the panicky markets carried many good stocks down to levels below their real value, and to this the public utility field offers no exception.

Executives Express Confidence in Underlying Conditions

Other leaders, including the President of the United States, made public statements expressing the following opinions which reflect confidence in the inherent soundness of industry and trade:

PRESIDENT HOOVER

"The fundamental business of the country—that is, production and distribution of commodities—is on a sound and prosperous basis. The best evidence is that although production and consumption are at high levels, the average prices of commodities as a whole have not increased and there have been no appreciable increases in the stocks of manufactured goods. Moreover, there has been a tendency of wages to increase and the output per worker in many industries again shows an increase, all of which indicates a healthy condition."

A. W. LOANSBY

Vice-President Equitable Trust Company of New York

"The market fell of its own weight without regard to fundamental business conditions, which are sound. I have no fear of another comparable decline. From now on the market will be a subject for discrimination. While some stocks have declined too far, it is true that some stocks are still too high. I look for future purchasing to have some relation to the earning power of stocks. Investors will buy returns rather than quotations."

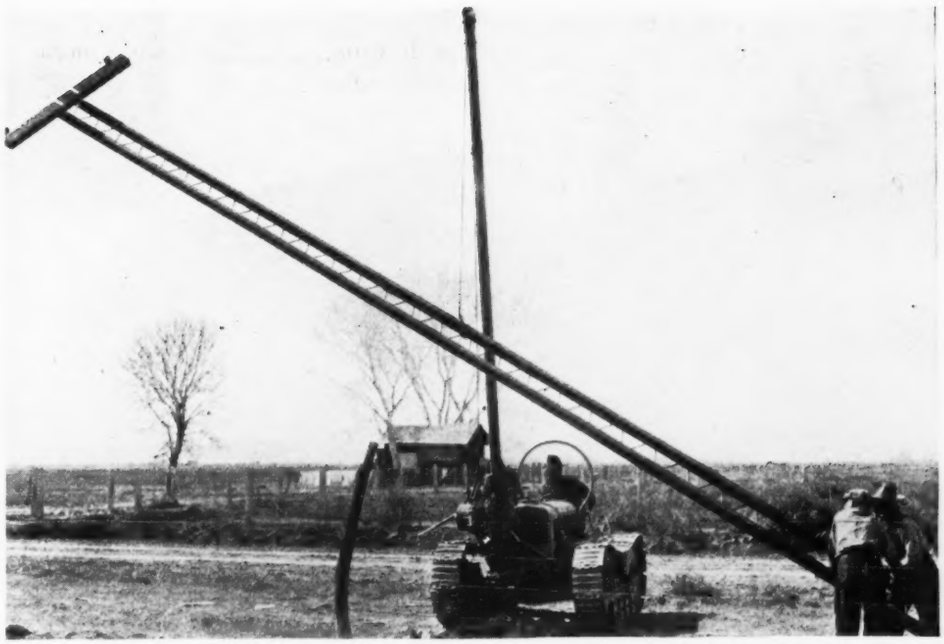
J. M. DAVIS

President Lackawanna Railroad

"Railroads are the largest consumers of steel, copper, coal, lumber and many manufactured articles, and records show that not only the railroads but also the manufacturers are carrying the lowest inventories since the World War, and with that condition there is no reason to believe that this country will not have good general business throughout the winter."

GUARANTY TRUST COMPANY

"Over a long period, prices of stocks and bonds are necessarily related to the prospects of the concerns they represent; and, in so far as other factors have carried values out of proportion to their intrinsic worth, the recent movement must be regarded as a readjustment toward normal levels. But to suppose that the selling wave of the last few weeks was due to adverse developments of corresponding importance in the general business situation would be a fundamental error."



Long-Life Construction Using Steel Poles with Concrete Setting

Electrifying 8,000 Farms

Five hundred miles of 4-kv. rural line using steel poles is built at a cost of $1,200 per mile. Every farm in 240,000-acre Salt River project will be served

By H. J. Lawson

Superintendent of Power
Salt River Valley Water Users' Association, Phoenix, Ariz.

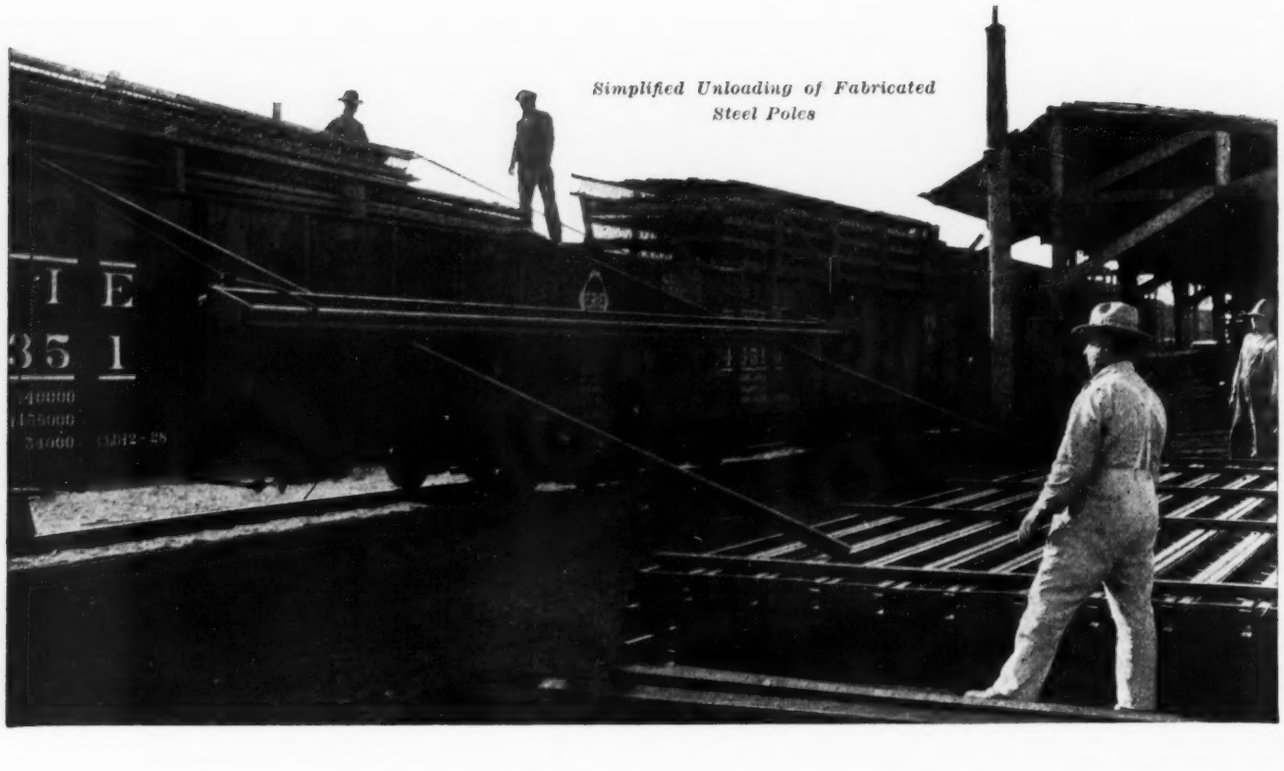
PROBABLY the largest rural electrification program under way in the United States is that nearing completion on the Salt River irrigation project near Phoenix, Ariz. Under this program $1,200,000 is being expended in building 500 miles of new line and rebuilding 250 miles of old line so that all of the 8,000 farms in the 240,000-acre district will receive electric service.

The government finished its work of construction and turned the management over to the water users of the project on November 1, 1917. Since that time more money has been spent on improvements and new construction than the government's original investment. Contrary to popular belief, the project is not a public or government ownership scheme. It is operated and managed by the Salt River Valley Water Users' Association, which is composed of the landowners served and, aside from the fact that the president is elected by popular vote of the farmers instead of by a board of directors, the affairs of the association are handled in identically the same manner as are those of any privately owned corporation or public utility. Because of this form of ownership and management the many evils that beset purely public ownership ventures have been obviated and the undertaking as a whole has enjoyed a remarkable degree of success.

Power System

The power system is entirely hydro-electric, with steam plants of several of the largest power customers serving as auxiliaries. There are seven water power plants in operation and one in course of construction having an aggregate capacity of 83,210 kva. Four of the plants are located on the Salt River in a mountainous region and four are located on the irrigation canals of the valley. Power is transmitted from three of the river plants at 110 kv. and at 44 kv. from the other. The valley plants all feed into the distribution system at 11 kv. and 44 kv.

Prior to the recent electrification program the valley was partially covered by a distribution system which supplied power at 11 kv. to some 200 pumping plants. Also, 44-kv. power lines extended in several directions through the valley. These 44-kv. and 11-kv. lines are used to supply nine substations throughout the valley,



Simplified Unloading of Fabricated Steel Poles

where the voltage is stepped down to 4 kv., three phase, four wire. Substations vary in capacity from 75 kva. to 1,000 kva. and supply power for the 4-kv. rural lines. Service men are stationed at each substation to take care of customers' services in the district served, as well as to read meters and patrol the distribution lines.

Most of the older distribution construction was on wood poles, largely butt-treated cedar, with some pressure-treated creosoted Southern pine. In recent years the ravages of termites (white ants) in untreated portions of the poles has become a serious problem. Under climatic conditions of the very dry and hot periods in the summer months cedar poles are especially subject to checking and opening up untreated parts to the attack of the termites. Pressure-treated Southern pine poles were considerably better in this respect. However, there had been installed on the project in 1912 a considerable number of steel poles set in concrete. After sixteen years of service these poles showed no indication of depreciation of any kind and the maintenance had been very low, about the only work required being one painting during that period. The main objections to these particular poles were their high first cost and the difficulty of making changes in pole top construction. They were a three-legged pole, the legs having a "U" section, and being clamped together.

Steel Poles Selected

For tne new construction a new type of steel pole was offered, comparable in price to wood poles and so designed as to be as well adapted for addition of crossarms as are wood poles. In view of the long life of steel poles evidenced by the 1912 installation it was decided to use this new type of steel pole set in concrete for the new construction. Setting the poles in concrete was particularly feasible on account of the large number involved.

The pole that was selected was the Weltrus copper alloy steel pole manufactured by the Truscon Steel Company. It is composed of two special section channel chord members connected with a round lattice web member electrically welded to the chords and forming a simple Warren truss. Poles of this type 35 ft. in length weigh 443 lb. and have an ultimate longitudinal strength of 490 lb. and a transverse strength of 1,240 lb.

The poles are 35, 40 and 45 ft. long, the large majority being of the shorter length. The upper 8 ft. of each pole is symmetrically punched on both faces with holes on 8-in. centers so that crossarms, buckarms, guys and other fittings may be attached with stock bolts at any point on all four faces of the pole without the necessity of field drilling or special parts. The poles were designed to permit use of 5- and 10-ft. pole-top extensions similar to the pole section so that at any time the poles may be lengthened to meet special conditions by bolting on a suitable extension member, a supply of which is carried in stock. Wood arm clamps designed to eliminate boring of the arms were used to fasten the crossarms to the pole. Crossarm braces were eliminated by the use of these clamps, and all connections are made with stock machine bolts.

Two pole-hole boring machines were purchased. These had a mast and winch, by means of which the poles were set in the holes immediately after the holes were bored. Only a few minutes' time was required to dig a hole and set a pole, as each crew could bore the holes and set from 45 to 60 poles a day.

One concrete crew followed each machine, lining up the poles and pouring the concrete as fast as the machines set the poles. After the concrete had set for about fifteen days the crossarming crews followed, and after them the wire-stringing crews.

In planning the work the concrete job appeared to offer the most difficulty. However, after starting, this worked out very satisfactorily and rapidly. The aggregate was hauled in dump trucks and a sufficient amount for $\frac{1}{2}$ mile of poles (each pole taking $\frac{1}{4}$ yd. of concrete) was dumped at $\frac{1}{2}$-mile intervals along the highwway. A 1-ton truck with a number of cans of proper size distributed the aggregate to the pole locations, leaving at each the proper

amount of gravel and sand in cans. These cans were made in the association's shop, of sheet steel with handles, so as to be easily handled by two men. They were refilled and redistributed after the mixing crew had emptied them. Water was handled in a similar manner by another small car, the water usually being available from the irrigation ditches in the vicinity of the work. A small mixer of ¼-yd. capacity, mounted on wheels, gas-engine driven, pulled by a small automobile and manned by a crew of five men, mixed and placed the concrete. This followed a crew of three men who lined up the poles and tied them in position with ropes attached to stakes driven into the ground. Within 45 minutes after the concrete had been poured the ropes were removed and used farther ahead on the job. The poles were concreted at the same rate as the holes were dug by machine, viz., 45 to 60 per day per crew.

Because this section of Arizona is in a very light loading area short poles and long spans were permitted. Standard pole spacing is sixteen to the mile, which makes the average span approximately 330 ft. in length. Hard-drawn bare copper wire was used for both primary and secondary circuits, the primary circuit being of the 2,300/4,000-volt, four-wire, Y type. Hot line tools are used to work the 4-kv. circuits as well as the transmission lines up to and including the 110-kv. circuits.

The electrification program was prosecuted with vigor, as evidenced by the completion of 500 miles of new construction and the rebuilding of 250 miles of existing lines, done mostly while service was maintained, in a period of eight months. Upon completion of the work it was found that the cost of the all-steel line had averaged $1,200 per mile, which was practically the same as the estimated cost of treated wood pole lines. From the experience with steel poles installed eighteen years ago it is apparent that much longer life, with freedom from damage by termites or brush fires, can be expected of the new steel construction.

Commercial Development

Use of electricity is rapidly increasing on the farms of the project. Besides the ordinary household appliances in use, power is used for cooking, water heating, domestic water supply, ensilage cutting, milking machines, cream separators, feed grinding, incubation and brooding, refrigeration and other uses. Mildness of the climate in the winter is conducive to the use of electricity for house heating and it is expected this element of the load will increase to a considerable extent. Use of electric ranges is quite extensive and rates are made to further encourage electric cooking. At present about 25 per cent of the farm homes connected for service are equipped with electric ranges. The combination rate for lighting, cooking, water heating and refrigeration for a total connected load of not less than 3 kw. is $4 minimum monthly charge, for which the customer receives 55 kw.-hr. The next 200 kw.-hr. is at 3 cents, with excess at 2½ cents, and a 5 per cent discount is applicable on the first $10 of the bill and 2 per cent on the balance if the bill is paid when due. A connection charge of $25 is made for each service connected and for this amount the customer is entitled to transformer capacity up to 7½ kw. If more than this amount of power is required the customer pays the cost of the transformer capacity in excess of 7½ kw.

The association operates an appliance store in its building in Phoenix, where standard appliances are sold at list prices and patrons may purchase there or from any of the many electrical dealers in the territory served.

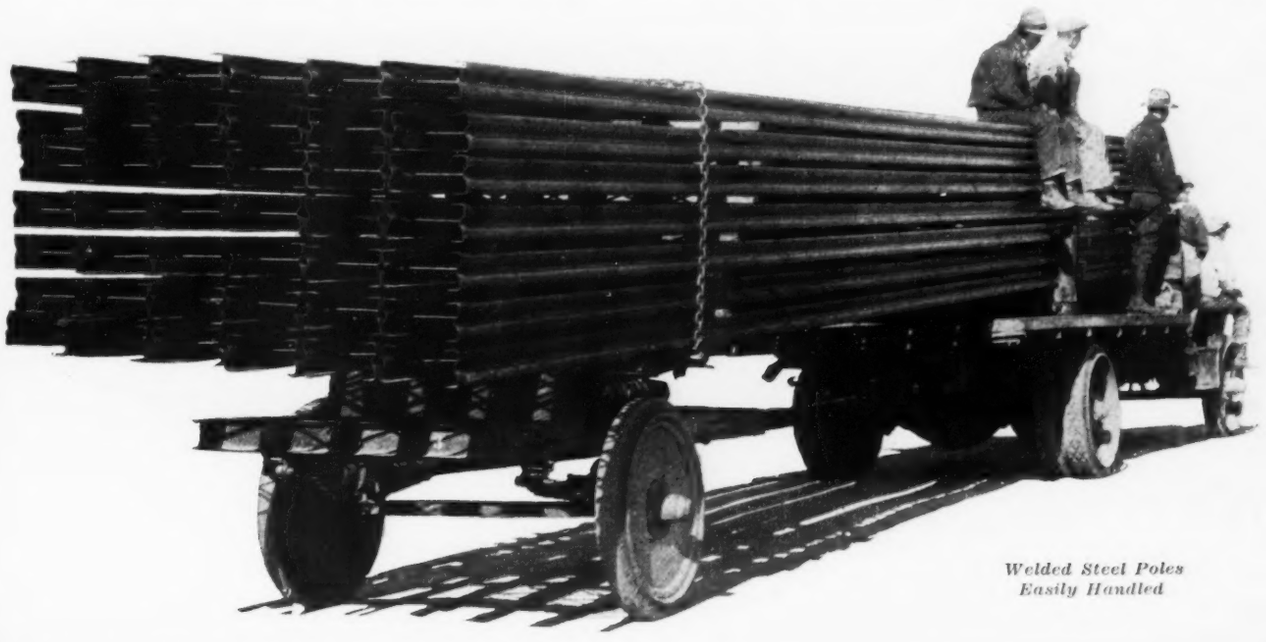
Engineering and planning of the electrification program were under the supervision of the author and construction was carried out by the association under the direction of F. L. Roe, superintendent of transmission.

Producing White Light Synthetically

By M. Luckiesh

National Lamp Works of General Electric Company, Nela Park, Cleveland

THERE are many places in the display and decorative lighting field where it is desirable to produce white light combining red, green and blue light. Colored light has many applications, such as in show windows, restaurants, dance halls, etc., where it is also desirable at times to have white light evolving from the colored light. This is a desirable feature which can be obtained if the proper



Welded Steel Poles Easily Handled

amounts of red, green and blue lights are available. Then mobile color can be used in such a manner that it passes through a cycle of tints and white light. A special application of interest is the obtaining of colored shadows along with a synthetic white light. For example, if red, green and blue lights are placed above a lattice upon which artificial foliage is arranged, white light will result where red, green and blue colored lights come through the lattice and mix, but the shadows produced by these different colored lights will be more or less displaced from each other and a rich colored shadow effect will result. The relative intensities of the different colored components necessary to produce white light are presented herewith. Three different combinations of colors were used in making these determinations: The "pure" red is a saturated red fairly free from yellow; the "pure" green is a green which is neither bluish nor yellowish, and "pure" blue is a saturated blue containing little or no red.

Color	Approximate Transmission of Colored Media, Per Cent	Relative Proportions in White Light, Per Cent	Relative Clear-Lamp Lumens Required, Per Cent,
Pure red	5	34	25
Pure green	4	61	57
Pure blue	1	5	18

The output of the foregoing mixture is approximately 3.7 per cent of the combined clear-lamp output.

	Per Cent	Per Cent	Per Cent
Light red	19	32	5
Pure green	3	57	63
Pure blue	1	11	32

The output of the foregoing mixture is approximately 3.2 per cent of the combined clear-lamp output.

	Per Cent	Per Cent	Per Cent
Light red	19	19	5
Strong yellow-green	11	71	32
Pure blue	1	10	63

The output of the foregoing mixture is approximately 5.1 per cent of the combined clear-lamp output.

While this method of producing white light is obviously inefficient for general use, it is justified in many display and decorative lighting effects. In such cases these data will serve as a guide to the proportions which will produce white light.

Where space is available and cost is not a primary consideration, four colors—red, yellow, green, and blue—in addition to colorless light (ordinary tungsten lamps) provide a wide range of colors and tints in a most practicable manner. Of all the hundred-odd hues available, there are only four distinctly different ones—red, yellow, green, and blue. Combinations of these with each other and with colorless light provide a great variety of colors and tints which supply most of the requirements.

Where space is limited and cost is a primary consideration, red, blue and colorless light provide in most cases, such as the small theater, a desirable and much used range of tints. The next step toward the use of the four-color system is a matter of judgment if not determined by the requirements of a specific case. Usually the addition of yellow as the third color is most desirable, although, of course, if green is specifically needed it becomes the third color.

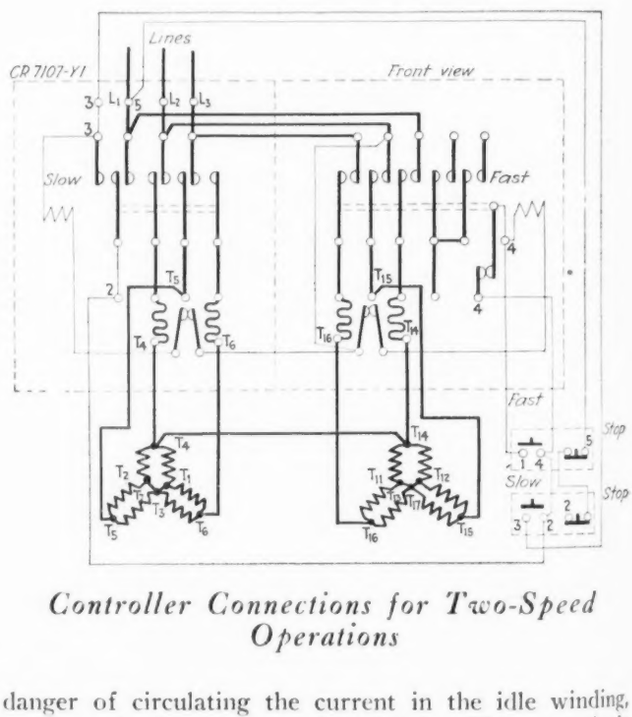
Automatic Two-Speed Control for Gasoline Pump Motor

By G. B. Henry
General Electric Company, Chicago

A MIDDLE WEST oil company recently desired to install suitable alternating-current motor and control for a centrifugal gasoline pump then being installed in Chicago. As the pump was a centrifugal type a constant-torque motor was recommended. As speeds of 1,800 r.p.m. and 1,200 r.p.m. would be required to supply the two rates of flow desired, it was found advisable to apply a double-rated 3/2-hp., 220-volt, 1,800/1,200-r.p.m., constant-torque, squirrel-cage motor with a somewhat unusual system for controlling speed and operation.

Automatic control was desired, and the presence of gasoline fumes required this control to be located outside the pump house. The push-button stations were located at the pump and are of the oil-immersed type, thus minimizing danger.

For both speeds of the motor the windings were Y-connected and terminals T_1, T_2, T_3, T_7 and T_{11}, T_{12}, T_{13}, T_{17}, were permanently connected together without



Controller Connections for Two-Speed Operations

danger of circulating the current in the idle winding, as shown in the accompanying sketch. These terminals were permanently connected behind the terminal board of the motor. A two-speed controller was adapted by using the fast contactor to connect T_{14}, T_{15}, T_{16} to L_1, L_2, L_3 respectively to obtain 1,800 r.p.m., and by using the slow contactor to connect T_4, T_5, T_6 to L_1, L_2, L_3 respectively to obtain a speed of 1,200 r.p.m. without undue complexity of equipment.

The standard two-speed switch was modified in the Chicago service shop of the General Electric Company and the modified connections are shown in the accompanying illustration. Two oil-immersed two-button stations with the start buttons marked "Fast" and "Slow" were installed at the pump. The arrangement has been operating satisfactorily for some time.

Letters from Our Readers

Says Reduction of Elevator Weight Has Little Advantage

To the Editor of the ELECTRICAL WORLD:

Evidently whoever wrote the editorial "Why Not Reduce Elevator Car Weight" in the September 14 issue of the ELECTRICAL WORLD is not familiar with elevator practice. In the first place, elevator car bodies of minimum weight are now in use. Every reasonable and *safe* form of construction that will reduce masses has been employed. Such parts as can *safely* be made of aluminum or of aluminum alloys have been so made in some recent installations. I know of no cases where the possible *safe* reduction in car body weight, consistent with rigid construction, would affect the number of ropes or rope sizes, save a very occasional installation where the architect's or owner's idiosyncracies have forced the use of cast bronze car bodies. Fortunately, such cases are rare and they are not likely to be repeated.

There is practically no scientific knowledge available as to the physics of running rope structure and performance. I say this in spite of any rope manufacturer's possible statements to the contrary. Running ropes are generally selected for any given elevator duty "by guess and by God" with the aid of a very liberal "factor of ignorance." For the past several years the sectional committee on Elevator Safety Code, A.E.S.C., has been seeking to eliminate the kitchen clock and thumb-rule method of calculation from the elevator industry and, so far, has been able to do little on ropes for lack of research. Since statistics show that over 90 per cent of all elevator accidents are so-called "landing door" accidents, most of them due to careless operation and use, the committee has devoted its attention largely to the problem of safe landings and to the other items of safety design that are of more immediate importance. Unfortunately, landing door accidents are not spectacular enough to constitute "news," so the committee has been somewhat handicapped in its efforts to bring about the necessary changes in laws and rules due to lack of public interest in the fundamental causes of elevator hazards. The accident insurance companies are now quite alive to this matter.

Compared to these matters, the question of car body weight is wholly insignificant, particularly in view of the fact that power consumption is a very small part of the annual operating costs. In this the elevator is very different from the railroad, where, due to the very low efficiency of the prime mover, reduction in masses will have a marked effect on operating costs. A reduction in elevator car weight of 500 lb., which, as such things now go, is a lot, might result in a reduction of a small fraction of a kilowatt-hour per car-mile.

Besides this, there is another matter: As the weight of the car is reduced, the difference between the mass of the car with and without load increases. The car safety must be set to stop and hold the fully loaded runaway car without either too long a slide or too sudden a stop. With the same, and necessary, safety setting the car, with light load, may be and sometimes is brought to so sudden a stop as to injure people in the car. Since we are primarily interested in safety, this effect indicates the need for some means of reducing this mass variation.

Your editorial writer is mistaken in thinking that "every pound of car weight adds 4 lb. to the load on the elevator machine, using wrapped traction owing to the rope passing over the sheave twice." If I get his meaning, his mechanics is faulty here. He is not dealing with a multiplying pulley system, but with a double wrap over the sheave to gain traction, not motion. There is no change between the relative velocity of the sheave periphery and of the car. The object of the double wrap is to make the friction sufficient to keep the ropes from slipping on the driving sheave. This also is one reason for the use of multiple ropes—to produce sufficient rope contact on the sheave to insure traction without going to sheaves of impractical diameter or to "stunt" sheave grooves which injure the ropes by pinching or otherwise.

BASSETT JONES.

Meyer, Strong & Jones, Inc.,
New York City.

In every new undertaking there are honest differences of opinion because the engineering data are incomplete and engineers view the subject from different angles. The information given in our editorial was based on actual designs worked up by a large elevator company in connection with engineers expert in the use of aluminum. Aluminum structural shapes will soon be available which are as strong as steel and can be readily substituted for steel shapes.

The weight of the elevator car is carried on ropes which pass over the sheave on the elevator machine and down to a counterweight. The weight of the car is compensated by an equal-weight counterbalance, therefore the load on the bearings and shaft of the elevator machine is equal to double the weight of the car. When a traction machine is used it is customary to pass the rope from the car over the driving sheave, thence down around an idler sheave and back over the driving sheave a second time. This causes a load to be imposed on the bearings and shaft which is equal to four times the weight of the car on the elevator cables. If 100 lb. is added to the car weight this load will be added to each side of the elevator machine twice, making the four times load spoken of in the editorial.—EDITORS.

National Electrical Code—Adequate Wiring

To the Editor of the ELECTRICAL WORLD:

I want to commend you for the editorial in the ELECTRICAL WORLD of October 5 on "Inadequate Wiring Continues to Imperil Development." In addition to the three tangible schemes which you have advanced for securing adequate wiring, there is of course a fourth one, i.e., having the National Electrical Code provide minimum requirements which are particularly necessary in those smaller buildings where architects do not lay out or control the adequacy of the interior wiring system. This adequacy would, of course, include the minimum requirements for service conductors, feeders and numbers of kinds of circuits and convenience outlets.

Not only does failure to have wiring adequate make the wiring installation quickly obsolete, hold back the use of electricity and prevent better satisfaction, but it causes early overloading and almost immediate hazard from this overloading, with resulting overfusing, undue use of long extension cords, etc.

Apparently everybody is now aware of this need for adequate wiring. I was impressed on my recent trip to inspector conventions on the West Coast with the fact that this is considered probably the greatest present problem connected with interior wiring and efforts for its solution appear likely to enlist the prompt co-operation of all concerned with interior wiring.

W. J. CANADA.

National Electrical Manufacturers' Association,
New York.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Beauharnois Power Development.—Construction work has recently commenced on the Beauharnois hydro-electric power plant and ship canal as the first step in the development of the long-debated St. Lawrence deep waterway scheme. This development is in a section of the river 18 miles long and takes advantage of an 83-ft. drop with a potential available horsepower of 2,000,000. This is said to be, from an engineering standpoint, the most economical section along the whole St. Lawrence River and possesses further advantages in being entirely upon Canadian territory. The initial development is for 500,000 hp. in 50,000-hp. generating units, with provision for further developments as may become advisable. An indication of the essential elements governing the development of the St. Lawrence River and of the probable disposal of the power generated at this particular location, as well as the cost of the development and the engineering features, have been included.—*Electrical News and Engineering (Canada)*, October 15, 1929.

Generation, Control, Switching and Protection

New Switchgear.—An oil circuit breaker offering a number of features new to this type of apparatus and for which important advantages are claimed has been developed in England. The device consists of a breaker of normal design, which is tripped by the fusing of any one of the three fuses that are carried under the moving crossbars of insulating material. On an overload or fault the circuit is interrupted by the fuse and the complete disconnection of all phases at the switch contacts follows instantly. The advantages claimed for the innovation are: The break is quicker than that of any ordinary circuit breakers operated by current transformers and the usual tripping mechanism. The fault, or overload, current is interrupted by a fuse, followed by two further breaks in series at the switch contacts, thus providing three breaks in series per phase, the fault current is always interrupted by the fuse, the amount of metal fused is limited so that the damage to switch contacts is avoided, and no current transformers are required, so that the breaker can be used on small-capacity circuits supplied by trunk lines, where current transformers of low primary rating would have insufficient mechanical strength, or thermal capacity, for safe use. The fuse can be set to operate with reliability at as low a current as 2½ amp. It is stated that the rupturing capacity is higher than that of an ordinary oil circuit breaker of similar size, the standard unit being rated nominally at 75,000 kva. A detailed description of the design and of the estimated advantages has been included.—*Electrical Review (England)*, October 4, 1929.

Transmission, Substations and Distribution

Effect of Temperatures Attained in Overhead Electric Transmission Cables.—A. V. Zeerleder and P. Bourgeois.—It is pointed out by the authors that hard-drawn copper wire after several years of service in overhead transmission lines generally becomes soft owing to the Joule effect of the electric current and to the effect of the solar heat absorbed by the cable. This situation, assumed to be a matter of common engineering knowledge, is considered in this discussion from the metallurgical point of view and the results of a series of tests reported upon. The conductors examined include copper, pure aluminum, steel—aluminum and some alloys of suitable composition. It is shown that copper and aluminum in spite of their lower increases in temperature due to current are heated to a degree which will seriously diminish their tensile strength, whereas an alloy composed of four-tenths per cent magnesium, five-tenths to six-tenths per cent silicon and less than three-tenths per cent iron, the remainder being aluminum, remains absolutely unaffected. The copper cables reach their annealing temperature even if loaded only with the same current density as the light-metal cables. The lower electrical conductivity of the heat-treated aluminum alloy as compared with the copper is thus counterbalanced not only by the lower specific gravity of the light-metal alloy but also by the fact that it will support higher current densities without being annealed.—*Engineering (England)*, October 4, 1929.

Illumination

Artificial Industrial Illumination.—C. A. Mackersey.—The author presents certain standards of intensity for artificial illumination as developed in Australian practice. An endeavor has been made to formalize and classify the information for ready utilization and not only formulas but a number of charts developed for the purpose are illustrated. The inherent characteristics of vacuum and gas-filled lamps, as well as reflection factors, and the influence of aging upon the value of the source, have been developed.—*Electrical Engineer (Australia)*, September 16, 1929.

Decorative Illumination.—Beatrice Irwin.—A general review of spectacular decorative illumination during the past fourteen years. The author has pointed out the general character of exposition and carnival lighting and has indicated the best features of several specific jobs. Particular attention has been devoted to the illumination at the Barcelona International Exhibition, at which obelisk, grand fountain and cascade lighting have been featured.—*Electrical Review (England)*, September 27, 1929.

Lighting Generating Plants and Substations.—Davis H. Tuck.—The difficulties peculiar to the lighting of turbine rooms and similar places in which very high ceilings are encountered offer the necessity for special provisions, and the author has outlined some of the basic requirements for good lighting as well as pointed out the results that may be obtained when adequate provisions are made. Outdoor substations, also involve a problem of their own, and an indication has been made of a suggested method for handling this problem with safety, correct operation and good appearance as desiderata.—*Electrician (England)*, October 4, 1929.

Heat Applications and Material Handling

A Large Thermal Storage Scheme.—The new headquarters of the London Underground Railways has been equipped for electric water heating with provisions for storage. The installation is most unusual in that it does not provide for the usual all-night storage, but is designed to be off-circuit during two four-hour peak load periods in each working day. The energy is taken from the 11,000-volt electric system and the maximum loading of the thermal storage installation is over 1,300 kw. The circulating water is heated in cylinders equipped with immersion heaters and the heating is carried out between the limits of 300 deg. and 130 deg. F. The boilers are fed with water from tanks on the twelfth floor of the building under a pressure of 70 lb. per square inch, so that the upper temperature limit is the boiling point. The method of automatically controlling the heat put into the system from the cylinders is of particular interest, since as long as the temperature of the flowing water does not fall below 130 deg. F. no water is admitted from the storage cylinders, but as soon as the temperature of the flow falls below that figure then water is admitted. A full description of the equipment used and of the arrangement for utilizing the electrical energy has been included, also the automatic features involved.—*Electric Review (England)*, September 20, 1929.

Electrophysics, Electrochemistry and Batteries

Insulating Papers.—A. R. DUNTON.—As the result of a critical analysis of the various papers which may be utilized for dielectric insulations, the author has listed some 28 or 30 of essentially different types and applications. A critical analysis of the physical and electrical properties of each has been included and particular attention has been devoted to the disintegrating influence of age upon such materials. Variations of electric strength with thickness have been critically examined and certain values established.—*Electrician (England)*, October 11, 1929.

Dielectric Structure and Behavior.—J. K. GILLETT.—A brief survey of various attempts to define the phenomenon of dielectric failure and the use of porcelain for experimental verification of theories. The author has investigated, in so far as possible, a number of fundamental theories and phenomena in connection with dielectric breakdowns and has pointed out the somewhat remarkable fact that the discrepancy between the molecular and the technical strength of material, both in the mechanical and electrical sense, can be explained by an appeal to the microstructure. He also raises the question as to what further influence the structure may exert upon the electrical properties of a material and its suitability for use.—*Electrician (England)*, October 11, 1929.

Miscellaneous

Electricity as Applied to Farming.—M. I. WILLIAMS-ELLIS.—A review of contemporary rural electrification procedures in Sweden. The discussion has been divided into the primary uses of motive power, lighting, heating and stimulation of crops by electro-culture. A critical discussion of the features of the design which should be incorporated for satisfactory service of appliances, farm motors and service outlets has been included. An estimate of relative cost and comparative economy has been attempted.—*Electrical Review (England)*, October 4, 1929.

Book Reviews

Yardsticks of Public Utility Operations and Construction Costs

By William W. Handy. Baltimore, Md.: Williams & Wilkins Company. 155 pages, illustrated. Price, $10.

This book is made available at a most opportune time as it gives yardsticks by which to judge electric and gas utilities as a whole or as individual companies. Of course, the word yardstick is used with reservation because none of the yardsticks alone gives a true measure of utility values. But coupled with judgment based on certain intangibles like caliber of management, commercial activity, market possibilities, public relations, etc., these yardsticks are invaluable aids.

The book is divided into two parts—one dealing with what might be generally classed as financial ratios; the second part with trends in utility construction costs. The form of presentation is particularly valuable, graphs being used almost entirely to enable securing mental pictures of the situation rapidly. In dealing with each ratio the average of the principal or "standard" groups of operating companies is shown for the last eighteen years, also the maximum and minimum ratios and the curve of a selected typical company. On these graphs it is relatively easy to plot, from financial manuals, the curve of any company which is to be compared with average, maximum or minimum conditions.

The construction cost trends have been made more valuable than the general data sometimes presented by treating each subject by geographical divisions—north central, south central, plateau, Pacific Coast, and Atlantic seaboard. Both tables and graphs are used in this section. Not merely over-all cost indices are given, but the system cost indices are broken down into important divisions, and labor is in most cases segregated, so allowances can be made for local conditions.

So far as accuracy is concerned, the book has back of it an author who has devoted fifteen years of his life to investigations of utility properties, embracing financing, investment, purchase and sale, valuations and rate cases.

As an important working tool, investment bankers, analysts and statisticians, trust and insurance companies, banks, public utility officials, engineers, accountants, regulatory commissions and public utility counsels should find this book of great value.

Transactions of the Fuel Conference

World Power Conference, London, 1928. London: Lund, Humphries & Company. Four volumes—853, 1384, 1485, 357 (Index) pages. Numerous illustrations, charts, inserts.

"The proceedings form a mine of information and should undoubtedly have a permanent place on the shelves of all those interested in giving further momentum to the present world-wide movement for a better utilization of fuels of all kinds," writes C. H. Lander, chairman of the technical committee, in the foreword. Detailed comment on this huge symposium is impossible, when it is considered that 48 nations were represented at the conference, which had in view the pooling of the experiments and experiences of the world. The range of subjects is extremely wide. The coal, peat, lignite, oil and gas industries are discussed economically, geographically, technically and with reference to their numerous applications, including, for example, electricity for domestic purposes and for industrial furnaces, power generation, coal carbonization, residential heating by various fuels, building insulation. The extensive index is an excellent and essential feature.

Einführung in die Komplexe Behandlung Von Wechselstromaufgaben

By Dr.-Ing. Ludwig Casper. Berlin: Julius Springer, Linkstrasse 23-24. 121 pages, 42 illustrations. Price, 6.60 reichsmarks.

This little textbook presupposes only a fairly elementary knowledge of electrical laws and of mathematics. It gives the impression of having been written by an experienced teacher. Probably its most interesting feature is the discussion of filter circuits, a subject heretofore not commonly included in this type of book, but now desirable, as the author points out, even for students of power engineering as distinguished from communication, because such circuits are beginning to find application in generator protection. The last section contains a number of illustrative problems with hints for their solution.

Book Note

RARE METALS.—An interesting and amply illustrated discussion of the properties and uses of the metals, especially tantalum tungsten and molybdenum. The book is not intended to be a treatise on the metals nor to be an exhaustive book of instruction on their use. It suggests that any one interested in going into these uses and properties further is welcome to use the facilities of the Fansteel Products Company's research laboratory.

Books Received

Studies in Securities. New York: J. H. Oliphant & Company, 61 Broadway. 120 pages.

Die Elektronenröhren und Ihre Technischen Anwendungen. By Prof. Dr. Hans Georg Möller. Braunschweig, Germany: Friedr. Vieweg & Sohn A.-G. 262 pages, illustrated. Price, 15 reichsmarks.

Direct Currents. By Carl E. Magnusson. New York: McGraw-Hill Book Company, Inc., 488 pages, illustrated. Price, $4.50.

American Society for Testing Materials Tentative Standards, 1929. Philadelphia: American Society for Testing Materials. 901 pages, illustrated. Price, $8.

Elektrotechnicka Rocenka ESC., 1929. By V. Ptacek. Nakladem Elektrotechnickeho Svazu Ceskoslovenskeho Teskem Prazske Akciove Tiskarny V Praze II., Lutzowova Ulice C. 3. 294 pages.

The Law of Building Contracts and Mechanics' Liens. By Myron H. Lewis. New York: Myron H. Lewis. 98 pages. Price, $2.

News of the Industry

Boulder Dam Decision Brings Out Protests

Representative Swing of California, author of the Boulder Dam bill, has expressed dissatisfaction with three points of Secretary of the Interior Wilbur's decision on the disposition of water power from that development (ELECTRICAL WORLD for October 26, page 852), and particularly with his announcement that the federal government will not equip and operate the Boulder Dam power plant.

Representative Swing still hopes the Secretary may be induced to let the federal government operate the plant and sell power wholesale at the switchboard. This would be a much more flexible operating arrangement, he argues, and would save power consumers the difference between 7 and 4 per cent interest on the investment.

If the government is not to operate the plant, private power companies receive too large a share in its management from the Wilbur plan, Mr. Swing feels. The amount of power reserved for small cities is not great enough, he says, and he will ask that this be increased. Secretary Wilbur reserved 4 per cent of the power for cities that have filed application for small quantities.

Dissatisfaction has also been expressed by Nevada men over the 18 per cent power allocation to that state and the ruling that all power she receives must be used within her own borders.

Another outcome was that the Colorado River Commission of Arizona announced on Wednesday that it had broken off all negotiations looking to a tri-state compact between Arizona, California and Nevada. The commission indicated that suit would be filed attacking the constitutionality of the Boulder Dam bill and challenging the right of Congress to allocate water of the Colorado River.

Los Angeles probably will try to alter the decision about installation of machinery. The city would rather pay for the machinery and deed it to the federal government than be taxed on it by Nevada and Utah, it is asserted.

Commenting on the announced allocation of Boulder Dam power made by the Secretary of the Interior on October 21, R. H. Ballard, president of the Southern California Edison Company, said: "The Edison company at this time has no intention of filing any protest against the division of Boulder Dam power as proposed by Secretary Wilbur, because the great necessity for water here is recognized and this company wants to cooperate in obtaining this water. The Edison company does not consider that it has been given as large an allotment of power as it should be given, but in the final analysis will make a separate contract directly with government on the matter of power."

Expenditure of $250,000,000 Confronts Water District

Estimates now available indicate that the aqueduct to bring the Colorado River water into southern California for domestic purposes will cost in excess of $200,000,000, while $20,000,000 additional will be required for the construction of the power plant at the dam and $30,000,000 will be necessary for transmission lines. The eleven cities making up the Metropolitan Water District will bear this expense on a basis of their assessed valuation, according to present plans. The city of Los Angeles under this program will be expected to pay 82 per cent of the cost, while Pasadena, the second wealthiest unit in the district, will pay 5.46 per cent.

Before bond issues can be called for in the eleven respective cities, it will be necessary for the Metropolitan Water District to obtain further information concerning an aqueduct route. The engineers of the district are expected to make their report on routes in November, and then a board of review will study their recommendations for several months, seeking to obtain detailed information beyond that submitted by the engineers.

Assistant Secretary Klein Deprecates Alarm

DISCUSSING the business outlook as affected by the Wall Street crash, Dr. Julius Klein, Assistant Secretary of Commerce, said over the radio on Tuesday of this week in support of the President's view, which is also his own, that "the fundamental business of the country—that is, production and distribution of commodities—is on a sound and prosperous basis":

"One may have due sympathy for the very considerable number who have lost money in the stock market without losing sight of the fact that there has been no change in the situation of the overwhelming majority of American families. The growth of the income of the nation and the advance in the well-being of its business men, its wage earners and its farmers during recent years has not been due to boom psychology nor to temporary and fleeting causes. Conclusive evidence lies in the steadiness of prices of commodities."

Saying that the fundamental factor in the general situation of business is "purchasing power" and that real purchasing power is made up of wages, salaries, receipts of farmers, merchants, professional men and others and the profits of industry, Dr. Klein remarked:

"The factors have not been changed by the drop in stock prices. The national income of the United States at this moment is hardly a fraction less than it was a month ago. Established indexes, such as the quantity of output of our farms, our mines and our factories and the volume of our railroad transportation, support this view."

East River's 160,000-Kw. Unit to Be Ready in December

"On the line" and now running at about one-fourth of its capacity, the new 160,000-kw. General Electric turbo-generator which has for months been in process of installation at the East River power station of the New York Edison Company will, it is announced by that company, be in full operation early in December. This unit, which the company says is "the largest and most powerful single-shaft, single-unit electric generating machine in the world," will bring the total generating capacity of the affiliated companies in Greater New York and contiguous territory up to 1,643,000 kw. The new machine has an efficiency of more than 98 per cent, and energy from it will be transmitted to Brooklyn, the Bronx, Queens Borough and Westchester County when and as it may be needed, as well as to Manhattan. It is the third unit to be installed in the East River plant, the other two being rated at 60,000 kw. each.

The three boilers are of the double Ladd type and were made by the Combustion Engineering Corporation. Each boiler has 3,786 tubes, 3 in. in diameter, and ten drums, the largest being 54 in. in diameter. The total length of the tubes in the three boilers is 69 miles. The furnaces burn pulverized coal at a temperature of 725 deg. and a pressure of 425 lb. Each boiler requires almost 1,000 tons a day if operated continuously at full capacity. The Ingersoll-Rand condenser has 90,000 sq.ft. of cooling surface, condensing 700 tons of steam an hour. The pumps have a capacity of 160,000 gal. a minute.

The total cost of this addition to the company's facilities was $12,500,000, divided as follows: Boilers and auxiliaries, $5,500,000; structural steel and building work, $3,000,000; electrical equipment and auxiliaries, $2,000,000; turbo-generator and auxiliaries, $1,500,000; condenser and auxiliaries, $500,000.

When the East River plant gets in full

swing the United States will boast two central-station operating systems with a capacity exceeding a million and a half kilowatts each, the other being that of the Chicago metropolitan system, which, as made public only last week, reached 1,517,700 kw. when the initial unit in the State Line generating station went into operation (ELECTRICAL WORLD, October 26, page 850).

New Jersey Public Service's Metuchen-Trenton Tie-in

With the recent completion of a transmission line between the Metuchen and Trenton (N. J.) switching stations eventually to be operated at 220 kv. the northern and southern zones of the electric territory of the Public Service Electric & Gas Company have been tied in, making possible an economical exchange of power between the Philadelphia Electric Company's generating stations, including Conowingo, on the one hand and the Kearny, Essex, Marion and Perth Amboy generating stations in the northern zone of the Public Service company on the other.

The Metuchen switching station is connected with Kearny, Essex and Marion by the transmission lines between Metuchen and Roseland switching stations, Roseland and Athenia switching stations and thence from Athenia direct to Kearny. The Trenton switching station receives its power in part from the Burlington generating station of Public Service but largely from the Philadelphia Electric over a transmission line direct to Trenton. Thus the line between Metuchen and Trenton makes for continuity of service and amply protects the entire territory.

Work on the new line was started in March by the transmission construction department, and in a little over six months it was completely finished and ready for service. The speed with which the line was constructed is emphasized when the number of towers, their unusual height and the difficulties of the terrain are considered. The transmission line runs parallel to the Public Service trolley line operating between Bayway and Trenton. The nature of the right-of-way, as well as the fact that many other transmission wires and one river had to be crossed, made it necessary to erect no fewer than 295 towers at an average height of 118 ft. Most of the ground into which the tower foundations had to be sunk was swampy and often full of quicksand, greatly complicating progress.

Tokyo Engineering Congress Opens

Three Hundred and Fifty Japanese Technicians Welcome 133 American Delegates and Their European Confreres— Sectional World Power Conference Also Meets

AMERICAN delegates to the number of 133 and their European confreres were welcomed to Tokyo this week as they assembled with the 350 men composing the Japanese delegation at the first engineering congress to be held in Japan. About 100 non-delegates accompanied the American contingent. In all 300 foreign delegates from 25 countries were in attendance. A regional meeting of the World Power Conference is being held at the same time in Tokyo, its agenda being printed below.

Prince Chichibu, brother of the Emperor and heir presumptive to the throne, opened the World Engineering Congress with an address of welcome. Prime Minister Yuko Hamaguchi, as honorary president, also appeared before the opening session, in the city of Tokyo's new municipal auditorium, and spoke for the Japanese government.

Later sessions of the congress, which will last until November 7, will be held in the chamber of the House of Peers in the National Parliament Building. Distinguished engineers of many nations have contributed about 800 papers.

Dr. Elmer E. Sperry is chairman of the American delegation. Japan's active

Scope of Program for Sectional Meeting of World Power Conference

TOKYO, OCTOBER, 1929

Section A—National and International Development of Power Resources.

(a) General — e.g., development and distribution of solid, liquid and gaseous fuels and of water-power resources; utilization of wind and tidal power, solar energy, terrestrial heat, etc.

(b) Economic considerations— e.g., production of energy, methods and costs.

Transportation of power resources and transmission of energy, methods and costs.

Section B—Rational Unification and Economical Administration of Electric Power Development.

(a) Technical considerations:

1. Electrical energy produced from water power, with special reference to power costs.

2. Electrical energy produced thermally, with special reference to the use of high-temperature, high-pressure steam.

Power stations operated with internal-combustion engines.

Joint operation with water power.

3. Unification of frequency and of voltage.

4. Joint use of trunk-line transmission systems of different utilities.

5. Interchange of power between operating systems of different utilities.

6. Interference on aërial communication lines (telephone and telegraph) due to proximity of super-high-tension transmission lines.

7. Investigation of methods for increasing the general use of electricity.

(b) Administrative considerations:

1. General administrative cooperation between power systems, public as well as privately operated.

2. Rates and tariffs; general conditions for sale of power.

3. Electric power distribution, general; provisions for fluctuation in supply and demand.

4. Utilization of surplus power.

(c) Legal considerations:

1. Control and supervision of the electricity supply industry.

2. Control of water-power concessions.

3. Taxes and rate control.

4. Effect of water-power development upon mining, fishing, forestry, irrigation, navigation, etc.

5. Public utility commissions and arbitration.

(d) General aspects:

1. Rationalization of the industry.

2. Public or private ownership of utilities.

3. Electrification of railways, general industry, agriculture, etc.

Section C—Economic Future of Power for Use in Transportation.

(a) Railway locomotives: Steam, electric, Diesel and turbine.

(b) Automotive vehicles, general: Bus service for branch lines and connecting service.

(c) Aëroplanes: Petrol and Diesel.

(d) Ship propulsion: Steam, Diesel and electric drives.

(e) Funicular railways.

(f) Overhead tramways.

Section D—Better Efficiency in Power Production.

(a) General.

(b) Amalgamation of smaller operating units.

(c) Superpower systems.

(d) Load distribution and load factor.

(e) Use of efficient power machinery.

(f) Improvement in efficiency of power machinery.

Section E—Distribution of Fuel and Power.

(a) Economic value of fuel-handling machinery.

(b) Distribution of fuel to large-bulk consumers.

(c) Distribution of fuel to domestic and small consumers.

(d) Distribution of power in cities and rural districts.

Section F—Smoke Abatement in Cities.

(a) General — e.g., effect of smoke on human life, vegetation, land and its value, etc.

(b) Selection of fuel and use of special equipment; anthracite, gas, coke and other smokeless fuels; equipments for securing complete combustion.

(c) Railway terminus electrification.

(d) Electricity in general industry.

(e) Electricity and gas for domestic use.

delegation is headed by Baron Koi Furuichi, president of the Engineering Society of Japan and of the World Engineering Congress; Baron Takuma Dan, director general of the Mitsu interests, and Baron Chizaburgo Shiba, member of the House of Peers.

At a banquet given by the American delegation on Thursday evening George Otis Smith, director United States Geological Survey, spoke of the international character of engineering and the devotion of the engineer to human progress. Claiming kinship for engineers with Tubal Cain, Ta Yu, Archimedes, Leonardo da Vinci, James Watt and other pioneers, Dr. Smith remarked:

"It is chiefly through electrical engineering that this world has become one great neighborhood, and quite fittingly too it happens that in the names of the practical electric units physicists of five nations are immortalized. In this international group we may detect special significance in the fact that resistance is measured by a unit with a Teutonic name, force by an Italian namesake, flow and quantity by two French units, capacity, work and power by an English trio, while the measure of electric lag—or inertia, shall we say?—bears an honored American name."

Lighting Engineers Confer in Schenectady and Lynn

Fifty-seven central-station lighting engineers from public utility companies in fourteen states attended a conference organized by the General Electric Company from October 23 to 29. The conference was opened at the illuminating engineering laboratory in Schenectady on Wednesday morning with addresses by Vice-President J. G. Barry, M. O. Troy, manager of the central-station department, and W. D'A. Ryan, director of the laboratory. The subjects considered in the afternoon included floodlighting, airport lighting and traffic control, as well as an inspection of the facilities of the laboratory. That night there was an inspection trip, including Schenectady's street-lighting system, electric fountain and airport lighting, with planes available for night flights.

On Thursday the conference subjects included combination flood and street lighting, publicity, lighting service, planned lighting, cable, street light control, decorative designing, electric fountains, new developments and special products, and student training courses. In the evening, at an informal dinner at the Mohawk Golf Club, the speakers were W. H. Robinson, manager of lighting sales; F. H. Winkley, manager of the lighting and cable division, and L. A. Hawkins, executive engineer of the research laboratory.

Friday morning was devoted to a continuation of the previous afternoon's program, and in the afternoon the lighting engineers inspected the Schenectady works and research laboratory. An open forum and general discussion were held Saturday morning, after which the men went by train to Boston, where Sunday was spent in sightseeing.

On Monday and Tuesday the engineers were guests at the Lynn (Mass.) works of the General Electric Company, where the lighting manufacturing facilities, the transformer work and additional lighting engineering facilities were inspected and discussed.

Not for "Public Defender"

Prendergast Tells New York Investigators that Commission Should Find Facts, Not Prosecute—Excessive Returns, "Going Value," Cost of Appraisals, New Methods for Valuation

WHEN the New York legislative investigating commission resumed its inquiry into the laws governing the Public Service Commission's procedure and practice on Monday of this week, William J. Donovan, counsel for the investigators, asked Chairman W. A. Prendergast of the commission his views on having a public defender or a special deputy attorney-general assigned to the commission to represent the public in an aggressive manner. Mr. Prendergast viewed the idea with disfavor, holding that the regulatory body should be a fact-finding one and not one to conduct prosecutions.

Mr. Prendergast told the committee that the book value of the properties was the basis more often used than any other method in determining rates. When a series of exhibits was brought forth to show that a large number of companies had a very high rate of return on the rate base fixed, sometimes equaling 20 to 30 per cent on book value, Mr. Prendergast told how these companies had been divided up among the various commissioners, who had taken up the question of rates with officers of the companies and had obtained eighteen voluntary rate reductions to the present date. Some of these reductions were not low enough yet, in the opinion of Mr. Prendergast.

Asked what were some of the reasons offered by utility presidents for their apparently excessive rates, Mr. Prendergast said that one of the principal ones was additions to fixed capital being made and therefore not indicated in the book value. He said that utility executives have never accepted these valuations as final, but have generally been willing to use them as a basis for discussing changes in the rate schedule with the commission. There is little basis, he said, for a feeling that the Public Service Commission has become too judicial and is not sufficiently alert to the interests of consumers.

On the following day Mr. Prendergast testified that "going value" of public utility corporations was considered as part of the assets in fixing valuation in some cases. A table of going valuations, he said, showed that their percentage varied from 7 to 20. The percentage allocated to going value was determined by judgment only.

There was dissent, it appeared, among the members of the commission as to how much weight to place on reproduction costs in fixing appraisals and rates. Discussing the heavy cost of appraisals, Commissioner Prendergast said that the inventory and appraisal of the New York Telephone Company cost $5,000,000 and that $50,000 was appropriated and used by the commission in "spot-checking." The cost of the New York Edison Company's appraisal was upward of $5,000,000 over a period of five years, he added.

At Wednesday's session two plans of valuation involving changes from present practice were presented—one by Chairman Prendergast and one by Dr. John Bauer, utilities expert for the investigating commission. Mr. Prendergast's plan was originally presented at the convention of the National Association of Railroad and Utilities Commissioners at Dallas two years ago, and its conclusions were printed in the ELECTRICAL WORLD for November 19, 1927 (page 1042). Dr. Bauer's plan coincides with Mr. Prendergast's in setting up a fixed rate of return of 7 per cent. Its most important difference lies in the proposal to have the Legislature prescribe as the rate base for all public utilities value as of a fixed uniform date plus the cost of the property added since that date. To this idea Mr. Prendergast takes emphatic exception as infringing on the constitutional right of utilities to enjoy a return on the rate base if and when it exceeds present value. Mr. Prendergast holds that fixed valuation and rate of return should be a matter of agreement between the Public Service Commission and the utility companies, not a matter of legislative enactment.

The commission hearings were adjourned until November 7.

Federal Water-Power Data to Be Available to New York

Senator Wagner's resolution directing the Federal Power Commission to make its reports available and extend such other aid as possible to the legislative commission and the Governor of New York in the inquiry now being conducted into commission law and methods in that state was adopted without objection on October 26. The part of the resolution referring to the Federal Trade Commission was, on motion of Senator Wagner, stricken out as the Trade Commission thought it inadvisable to make its records available at the present time.

Boston Edison Rate Case Set for November 7

The first hearing in the investigation into rates of the Edison Electric Illuminating Company of Boston will be held at the State House on Thursday morning next. The hearing will be given not only on the petition of 25 customers of the Edison company, but also on the motion of the Department of Public Utilities itself.

Purchases and Mergers

Associated Gas & Electric Acquires the American Utilities, Empire Public Service the East Coast Utilities, and Connecticut Power Stamford G. & E.

ACQUISITION by the Associated Gas & Electric Company of the American Utilities Company of Harrisburg, Pa., just announced, transfers to the purchaser electrical utilities in Safford, Ariz.; El Dorado, Ark.; Jellico, Tenn. (serving also Kentucky territory); Lafayette, La.; Genevieve, Mo.; Buffalo, Okla., and Tucumcari, N. M.

Announcement is made by the Empire Public Service Corporation of Chicago, which already owns several small Maryland light and power companies, that it is adding to its holdings in that state and acquiring companies in Virginia and North Carolina by the purchase of the East Coast Utilities Company of Chicago, controlling the Maryland East Coast Utilities, Pocomoke City, Md.; the Northwest Carolina Utilities, Brownsville, N. C., and the Virginia East Coast Utilities, Waverly, Va. The Empire Public Service is also purchasing the Somerset (Va.) Electric Company, the Betterton (Md.) Ice & Electric Company, the Suburban Electric Company of Maryland, the Old Dominion Public Service Company of Virginia and the Blowing Rock (N. C.) Light & Power Company. These acquisitions furnish altogether light and power to eight thousand customers in the three states named and Delaware.

Stockholders of the Stamford (Conn.) Gas & Electric Company have been offered four shares of the Connecticut Power Company of New London (par $25) in exchange for each share of the Stamford company (par $100), control of the Stamford company to remain in Stamford through the formation of a voting trust. The Hartford Electric Light Company controls the Connecticut Power Company. It is intended to retain the present management of the Stamford company. Samuel Ferguson, president of the Hartford and Connecticut power companies, has been active in the Stamford directorate for some time.

Negotiations for the purchase of the Rockville-Willimantic Lighting Company, Willimantic, Conn., by the Connecticut Electric Service Company, Hartford, are reported to be under way. The Rockville-Willimantic company's common stock is held by the Eastern Gas & Electric Securities Corporation. It has 47 miles of transmission lines with generating stations in Rockville and Willimantic.

The Power Syndicate Company in Texas has sold its permits and franchises for water rights and the construction of five dams and hydro-electric plants on the Colorado River in Travis, Burnet and Llano Counties to Emory, Peck & Lockwood of Chicago. This is the enterprise with which the Insull interests were for a time associated, as reported in the ELECTRICAL WORLD, withdrawing support when controversy arose over the appropriation of water.

Permission has been granted by the New Hampshire Public Service Commission to the Central Vermont Public Service Corporation to acquire all of the New Hampshire assets of the Vermont Hydro-Electric Corporation, the Bradford Electric Light Company and the Windsor Electric Light Company. The commission, saying that "the acquisition of utilities operating in New Hampshire by a foreign corporation does violence to the spirit of the laws of the state," none the less gave its consent in consideration of the fact that "ultimately the properties in this state owned by the purchasing company will be operated by a New Hampshire corporation."

The Ohio Public Utilities Commission has authorized the Ohio Power Company, Canton, to purchase for $11,000 the transmission line from Mount Vernon to Gambier, now owned by the Suburban Power Company of Alliance, and the power distribution system in the village of Gambier.

Citizens of Defiance, Iowa, have voted three to one to sell the electric equipment owned by the city to the Iowa Public Service Company for $20,000 and to grant that company a 25-year franchise.

The American States Electric Company, a subsidiary of the American States Public Service Company of Los Angeles, has purchased the stock of the Dearborn-Ripley Light & Power Company, serving communities with a population of 3,000 in southeastern Indiana. Terms of the purchase were not made public.

The Utah Power & Light Company is now serving the towns of Orangeville and Castledale, Utah, in the Carbon County district, having recently purchased the property of the Electric Power & Milling Company. The Utah Power & Light has also purchased the municipal plant and system of Grace, Idaho.

Matt R. Williams, owner and operator of an electric power plant at Deer Trail, Colo., has asked the Public Utilities Commission for permission to take over the Byers Light & Power Company and build a transmission line between the two plants.

Aldermen of Sydney, Nova Scotia, have recommended that the city buy the power distribution plant of the Cape Breton Electric Company upon the expiration of the company's contract with the city in 1930 and either build a power plant of its own, steam or hydro, or buy power from the Dominion Iron & Steel Company as the Cape Breton Electric Company is now doing.

Decision on Flathead River Unlikely to Be Changed

Claims by Walter H. Wheeler with regard to his market for power to be developed at the proposed project on the Flathead River in Montana, made in the course of hearings before the Federal Power Commission this week, appear to have been attacked successfully by the representatives of the Rocky Mountain Power Company and its backer, the Montana Power Company. The representatives of the power companies also seem to have scored a point in their effort to show that Mr. Wheeler has no assurance of the necessary financial support to develop the project and in establishing that there is great doubt as to the commercial feasibility of fertilizer manufacture in that vicinity.

As this was written the hearing still was in progress, but nothing had developed to indicate that the commission will override the recommendations of its staff that the license be awarded the Rocky Mountain Power Company. Whether or not the commission will have the political courage to grant the license at an early date, in the face of the determined character of the opposition, remains to be seen.

West Virginia Utility Men Meet at Wheeling

Gospel of Good Service and Better Public Understanding Is Preached—Rural Service, Safety and Merchandising Are Other Topics

STRESS was laid at the twelfth annual meeting of the Public Utilities Association of West Virginia, which was held at Wheeling on October 23 and 24, on the need for a higher caliber of service and a better understanding on the part of the public of the problems of utilities. Electrification of rural communities was also one of the major subjects discussed. There was an attendance of between 185 and 200 delegates from all sections of the state.

President A. Clint Spurr said that the public was being informed of some of the alleged mysteries surrounding public utilities, and he felt that the educational committees of the various organizations had done a great work along that line. He briefly traced the development of utilities in West Virginia and linked their growth with the growth of electricity all over the world.

R. S. Soule of Fairmont, educational director of the Monongahela-West Penn Public Service Company, talked on "The Conference Method of Improving Contacts." "Transportation Problems in West Virginia" was the subject of an address by Charles Gordon, managing director of the American Electric Railway Association. Safety work by the various utilities of the state was briefly discussed by W. A. Buchanon of Morgantown, A. Clint Spurr and H. F. Webb.

On electrification of rural communities R. Paul Smith of Hagerstown, Md., vice-president Potomac Edison Power Company, said: "There is an attitude among many rural communities that they have been shunned by the utility companies. The farmer is just as important in electricity consumption as the urban user."

A brief address on "Rural Electricity" was made by J. R. Howard of Washington, D. C., past-president of the American Farm Bureau.

A "movietone" message from Thomas A. Edison was given at the annual dinner, at which A. Clint Spurr was master of ceremonies, the principal speaker being H. C. Ogden, publisher of Wheeling newspapers, whose subject was Edison.

On the second day three members of the Monongahela-West Penn group made addresses on the general topic "The Right and the Wrong." Merchandising was the subject of George E. Whitwell, vice-president Duquesne Light Company of Pittsburgh, who observed: "Merchandising can well be divided into four parts. They are the actual selling, price, service and distribution. The best method of increasing sales is to persuade each employee to become a salesman through his enthusiasm and attitude toward the company. If the proper co-operation between producing manufacturers and

distributing agencies were obtained, it would be possible to reduce the price of commodities placed on the market by utility organizations."

New officers were elected as follows: President, W. F. Ficklen, Charleston; first vice-president, C. H. Hardesty, Fairmont; second vice-president, F. M. Hawley, Bluefield; third vice-president, H. M. Cogan, Charleston. A. Bliss McCrum was re-elected secretary and B. M. Moir treasurer.

A.E.C. for St. Lawrence Waterway

At Administrative Board Meeting in Washington It Discusses Also Patent Office Matters, Defending Engineers' Right to Act as Consultants

INDORSEMENT was given to the Great Lakes-St. Lawrence Waterway by the American Engineering Council at the meeting of the administrative board in Washington on October 24 and 25. By a unanimous vote the board urged enactment of the Mapes bill for establishment of an international board of engineers to work out and report within one year detailed plans and specifications, and with only five dissenting votes the board approved the McLeod resolution expressing the readiness of the United States to proceed with the development of the St. Lawrence Waterway as soon as the Canadian government signifies its approval. The recommendations of the public affairs committee on both of these measures were adopted with very little debate.

On the recommendation of the secretaries of the four founders' societies, the board voted to accept the invitation to participate in the formulation of the policies of the Rosenwald industrial museum in Chicago and will appoint two representatives from the council as advisers to the board of directors of the museum. The board also indorsed the Fish resolution and the Copeland bill to create a commission to study plans for establishment of a national museum of engineering and industry.

The patent situation was the subject of considerable discussion, and the board instructed its patents committee to determine to what extent the reforms inaugurated by Mr. Hoover when Secretary of Commerce have been carried out. This investigation will be made with a view to submitting to the present Secretary of Commerce recommendations for further improvement in Patent Office practice. Changes in the phraseology of the Cramton bill to prevent unqualified persons from practicing in Patent Office proceedings were recommended to insure that engineers shall not be restricted in rendering scientific, technical or other services.

The committee on communications reported progress in consideration of the Couzens Communications and Power Commission bill and announced that it would bring in a definite report at the next meeting of the assembly, which will be on January 9 to 11 in Washington.

Great Lakes Engineers Discuss Stability

Diverse Aspects of System Equilibrium Problem and Means for Remedying Specific Conditions Are Brought Out at Section Meeting—Work Planned for Coming Year

AN EMINENTLY sensible conclusion, that the electric stability of a system is closely linked to the economic stability of the company operating it, was drawn from the open sessions of the Great Lakes Engineering Section, N.E.L.A., held at Madison, Wis., on October 23 to 25. This conclusion summed up the paper by J. H. Foote, of Stevens & Wood, which was the last of four in the general open meeting sponsored by the electrical apparatus, hydraulic power and prime movers committees of the section. The three other papers—on stability as affected by hydraulic plant design, by steam plant and substation design and by transmission system design—presented respectively by Forrest Nagler of Allis-Chalmers, Robert Treat of General Electric and C. L. Fortescue of Westinghouse, were also excellent and served admirably as concrete details for the logical structure of considerations on stability that should and can be included in average operating systems as set forth by Mr. Foote.

The meeting was opened by Alex D. Bailey, chairman of the Engineering National Section, with a brief presentation of the general stability problem as it arises from the modern practice of system interconnections and from the normal growth of system. The characteristics of hydraulic turbines peculiar to that type of prime mover were clearly explained by Mr. Nagler in his contribution to the symposium. From these characteristics certain responses may be expected during periods of system disturbance, but so far as the prime mover itself is concerned no improvement resulting in better stability performance can be looked for. This is because the electrical and mechanical phenomena of a disturbance of stability are so fast as to be wholly impossible of any control by turbine regulation.

In his paper on the effect of steam plant and substation design on system stability, Mr. Treat listed six possible means of preventing machines falling out of synchronism. These means included the reduction of short-circuit currents and durations, the control of prime-mover power input, excitation and regulation, the use of synchronous condensers, and frequency control. He discussed in detail the virtues of these methods of attacking the problem and indicated those that to his mind were possible of greater development as well as those whose limits of effectiveness had been already reached.

The part played by design of transmission systems in the matter of stability was made very clear by Mr. Fortescue. His paper, analyzing line performance in minute detail, was graphically illustrated by the action of a mechanical model. Line outages from lightning discharges were adequately discussed, as were also other factors affecting the stability problem, such as suppressed discharges, impulse-ratio time-lag characteristics, recording oscillographs and calculating boards.

Stability is not one problem, but many, Mr. Foote asserted in beginning his remarks. According to the type of system considered the problem assumed different aspects from points of view both engineering and economic. On the larger systems the economic consideration might often give way entirely to the engineering, but this is emphatically not the case on the smaller ones. On these the operator must look for largest control of system equilibrium from operating methods and general design rather than from the use of specially devised equipment whose cost would be an important part of the total system investment. He brought out the thought also that interconnections may prove to be not altogether unmixed blessings to the smaller systems in that disturbances in the systems to which they are tied may often affect them.

At the dinner Prof. D. W. Mead gave an enlightening talk on the engineering aspects of the Boulder Dam project.

This being the first meeting of the section in its new year, the work of the various committees was just getting under way. None the less, some very interesting papers, notably those on distribution transformer performance and underground cable operation, were presented to the various groups. A new committee on power-system design patterned after the national group on the same subject was formed. There were more than two hundred registered at the meeting.

Governor of Missouri Orders Inspection of Dam Sites

The size of the water-power projects now getting under way on the Osage River and the White River in Missouri has led Governor Caulfield to instruct Stratton Shartel, the Attorney-General of the state, and H. A. Buehler, State Geologist, to start an investigation with the object of insuring the safety of the dams to be built for these and other undertakings. The companies for which the dams are being built have agreed to co-operate. The Governor said:

"I am pleased to see so many water-power developments coming to Missouri, but one cannot help feel a little resentment at the state's lack of control of these matters. I do not think that a representative of the state should have to make investigations which actually go outside his authority, and I do not think the state should be dependent upon the courtesy of those building the projects for the right to inspect them."

Briefer News

MINNEAPOLIS ALDERMEN TO APPRAISE NORTHERN STATES POWER COMPANY. — The Minneapolis City Council has voted to evaluate the property of the Northern States Power Company in that city and to determine the relationship of its rates to its earnings. A committee of thirteen aldermen will engage an expert to make the valuation.

NORTHERN STATES POWER COMPANY GETS NEW FRANCHISE FROM BAYPORT, MINN.—A ten-year franchise for furnishing electricity to the municipal distribution system of Bayport, Minn., has been awarded the Northern States Power Company by the Bayport Village Council. The old franchise expired September 15, and a proposal to sell the system to the Northern States Power Company was thrice defeated.

TRANSMISSION LINE FROM FIFTEEN-MILE FALLS WILL CONNECT THIRTY NEW HAMPSHIRE COMMUNITIES.—The Grafton Power Company has petitioned the Public Service Commission of New Hampshire for authorization to maintain a power line from its huge plant now under construction at Fifteen-Mile Falls on the Connecticut River to the Massachusetts state line. Thirty cities and towns will be on the New Hampshire line, which will run through the central section of the state for two-thirds of its entire length.

PRESIDIO (TEX.)—PLANT TO BE ENLARGED AND MAY SERVE MEXICAN DISTRICT.—Immediate enlargement of the Central Power & Light Company's plant at Presidio, Tex., will be made, increasing its capacity from 2,300 kva. to 11,000 kva. If the Mexican government grants the necessary permit, the transmission system of the company will be extended to Ojinaga, situated opposite Presidio, on the other side of the Rio Grande, and to Mexican irrigation pumping plants in the valley of the Conchos River.

BRITISH COLUMBIA POWER CORPORATION PLANS TO SPEND $50,000,000 BY 1936.—The annual report of the British Columbia Power Corporation divulges the information that the company plans an expenditure of $50,000,000 in the next six years. This money will be spent largely on the Ruskin, Bridge River and Campbell River developments, with provision for necessary equipment in the company's different lines of business in the cities of Victoria and Vancouver.

ARUNDEL CORPORATION GETS CONTRACT FOR SAFE HARBOR DAM.—As predicted in these columns last week, the Arundel Corporation of Baltimore has obtained the contract for construction of the dam and power house for the new Aldred hydro-electric development on the Susquehanna at Safe Harbor, Pa. This development calls for an investment of $30,000,000, a substantial part of which will be covered by the Arundel contract.

CLAUDE NEON LIGHTS AGAIN LOSES IN SUIT.—The Appellate Division of the New York Supreme Court has denied the motion of Claude Neon Lights, Inc. (ELECTRICAL WORLD for September 21, page 586, and October 5, page 704), to certify the case involving the sale of Claude Neon Federal Company of Chicago by the Insull interests to the Rainbow Luminous Products, thus apparently freeing the way for the sale.

ONLY ONE MUNICIPAL PLANT IN NEBRASKA TAKES ADVANTAGE OF NEW LAW.—The Hastings municipal plant is the only one so far that has taken advantage of the law passed at the last session of the Nebraska Legislature permitting cities to extend their lines as far as 15 miles into the country where the gross revenues equal 15 per cent of the total cost of construction. It has approved two proposals serving 150 farmers.

COMMISSION REFUSES REHEARING ON VALUATION OF GREAT WESTERN POWER'S SAN FRANCISCO DISTRIBUTING SYSTEM. — The California Railroad Commission has denied the petition of the Great Western Power Company for a rehearing on the commission's order fixing compensation to be paid by the city of San Francisco for those portions of the company's distributing system in San Francisco which the city desires to acquire for Hetch Hetchy power. The commission fixed the valuation of those properties as of February 11, 1924, at $11,815,000, including severance damages of $3,375,000. The company had evaluated the properties and business at $30,000,000, with $15,000,000 for severance damages.

ST. LOUIS' NEW 8,000,000-CP. BEACON.—An 8,000,000-cp. beacon light for the guidance of aviators has been installed on the top of the 157-ft. water tower erected at Twentieth and East Grand Avenue, St. Louis, in 1870. The beacon was placed on the tower by the North St. Louis Business Men's Association on October 14, the dedication ceremonies attracting a great crowd of spectators. The light is visible for 25 to 50 miles, depending on weather conditions.

KEYSTONE COMPANY MAKES RATE REDUCTIONS. — The Keystone Public Service Company, serving the communities of Oil City, Franklin and Titusville, Pa., has announced sweeping reductions in its residential rates for energy, effective at once. More than 10,000 consumers are affected, and it is estimated the savings will aggregate $41,000 annually. Under the new rates electricity will be furnished in three blocks, the first with a 10-cent kilowatt-hour rate, the second with a 5-cent rate and the third at 3½ cents. The size of the blocks depends on the size of the home served.

NEW OFFICE BUILDING FOR DALLAS POWER & LIGHT.—Proposals have been submitted to the Dallas City Commission by the Dallas Power & Light Company for the erection of an eighteen-story office building at the northeast corner of Jackson and Browder Streets, to cost approximately $1,250,000. As soon as the plans are approved the erection of the building will be started. The base of the structure will be faced with plain black marble and the remainder of the outside walls will be faced with light-colored brick or stone, trimmed with terra cotta. The company's executive and operating forces will occupy half the space in the new building. The remainder will be leased for the present.

WISCONSIN COMMISSION TO CONSIDER FEASIBILITY OF UNIFORM RATES.—Hearings will be opened soon by the Wisconsin Railroad Commission in response to a resolution adopted by the last Legislature for inquiry into the feasibility of setting up uniform electric light, heat and power rates in Wisconsin. The resolution points out the wide diversity in the present rates in various parts of the state and calls for an investigation directed particularly to the possibility of reducing rates to householders and farmers. The commission

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

National Electrical Credit Association—Middle and Southern Atlantic States Association, Hotel Sylvania, Philadelphia, Nov. 8; Central Division, Nov. 21 and 22 (place to be selected); New York Division, Hotel Pennsylvania, New York City, Dec. 10; New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Electrical Wholesalers' Association—Hotel Cleveland, Cleveland, Nov. 11-15; Pacific Division, Del Monte, Calif., Jan. 31-Feb. 1. E. Donald Tolles, 165 Broadway, New York.

Electric Heating and Welding Conference—William Penn Hotel, Pittsburgh, Nov. 13 and 14. J. F. Kelly, Empire Bldg., Pittsburgh.

Public Utilities Association of Virginia—Chamberlin-Vanderbilt Hotel, Old Point, Va., Nov. 21 and 22. A. B. Tunis, 306 Grace Securities Bldg., Richmond, Va.

American Institute of Electrical Engineers—District meeting, Chicago, Dec. 2-4; winter meeting, New York, January 27-31. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mechanical Engineers—New York, Dec. 2-6. C. W. Rice, 29 West 39th St., New York.

American Society of Refrigerating Engineers—New York, Dec. 4-7. D. L. Fiske, 37 West 39th St., New York.

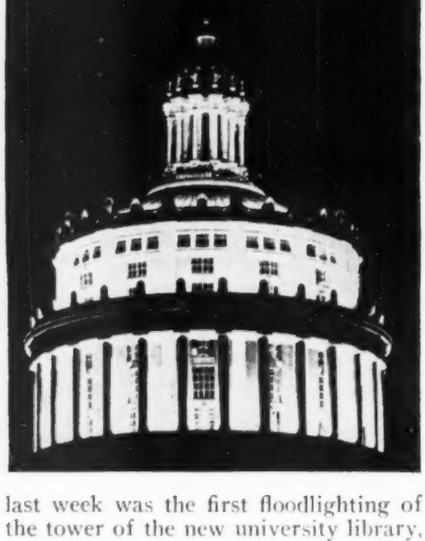
American Engineering Council—Washington, Jan. 9-11. L. W. Wallace, 26 Jackson Place, Washington, D. C.

North Central Division, N.E.L.A.—Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

may open hearings in Milwaukee within a month and later sessions will be held in Marinette, Eau Claire and other cities. It is formulating a questionnaire to be presented to private and public utilities.

GATINEAU POWER COMPANY ENERGY CALLED FOR A YEAR AHEAD OF CONTRACT.—The Gatineau Power Company has commenced delivery of an additional 20,000 hp. to the Hydro-Electric Power Commission of Ontario. This amount, originally scheduled for delivery on October 1 of next year, increases to 182,000 hp. the total now being delivered, of which 150,000 hp. is being sent over the 220-kv., 230-mile transmission line from the company's plant on the Gatineau in the Ottawa district and distributed by the commission in the Toronto area.

ILLUMINATION OF UNIVERSITY OF ROCHESTER LIBRARY TOWER.—A leading event in the celebration of "Light's Golden Jubilee" at Rochester, N. Y.,



last week was the first floodlighting of the tower of the new university library, which was carried out even though the masons had not quite completed its construction.

SUMNER, IOWA, BENT ON MUNICIPAL OWNERSHIP.—For the second time this year a franchise renewal has been refused to the Central States Power & Light Company by the citizens of Sumner, Iowa, this time by 75 majority. The city has authorized the Municipal Utilities Company, Des Moines, to construct an electric power plant under a municipal ownership plan, but the Central States company is seeking to prevent the construction or operation of the plant during the life of its franchise.

GERMAN ELECTRICAL ENGINEERS TOURING AMERICA.—A group of seven members of the German Society of Electrical Engineers arrived in New York on the steamship *Berlin* on Monday of last week for the purpose primarily of making an inspection tour of electrical plants and laboratories. Besides New York City, they will visit Niagara Falls, Cleveland, Detroit, Chicago, Pittsburgh, Washington, Philadelphia and other cities. The members of the party are Prof. Dr. H. Gerdien, Institute of Technology, Berlin; Ing. Philipp D. Metnitz, Donawitz; Dr. Walter Siebert, Marburg; Ing. Z. K. Strasser, Donawitz; Sigmund Strauss, Vienna; Mrs. Lotte Strauss, Vienna; Dr. Max Wenger, Dresden, and William Solbach, tour manager.

FIRST STAGE OF LAKE LAMOKA HYDRO PROJECT COMPLETED.—A hydro-electric generating plant at Lake Keuka, N. Y., rated at about 3,200 hp., is now complete and connected with a 33,000-volt line to Hammondsport and Bath, N. Y. It will eventually serve Penn Yan also. Future development of this project, plans for which have several times been reported in these columns, now awaits construction of a dam at Bradford which will form a lake 14 miles long in the valley of Lamoka and Waneta Lakes.

WORK BEGINS ON NIANGUA RIVER DEVELOPMENT.—The Management & Engineering Corporation of Dubuque, Iowa, has started construction on the Central States Power & Light Company's hydro-electric dam and power plant to be built on the Niangua River near the southern end of Camden County, Mo., and about 27 miles north of Lebanon, Mo. The dam will be 17 ft. high and 400 ft. long and the company will also build a tunnel 13 ft. square through an 800-ft. limestone cliff. The power plant will include two generating units with a capacity of about 12,000,000 kw.-hr. per year.

ANOTHER DEVELOPMENT PLANNED FOR NEW RIVER.—The West Virginia Power Company, the third seeking a site for a dam on New River, will petition the Public Service Commission of West Virginia for permission to construct a concrete dam and power house nearly three miles below the junction of the New with the Bluestone River. This application was first filed in 1924, but was not pressed. The company wants to impound 204,000,000 gal. of water in a 9,040-acre storage basin. With a minimum flow of water 84,000 hp. could be generated, according to the application.

JACKSON RIVER HYDRO SITE TO BE DEVELOPED BY VIRGINIA PUBLIC SERVICE COMPANY.—Purchase of 12,000 acres on Jackson River, in Bath and Alleghany Counties, Va., 20 miles from the West Virginia boundary, by the Virginia Public Service Company of Charlottesville for the development of a hydro-electric plant costing between two and three million dollars is announced by that company. The project will involve the creation of a lake with a shore line of 100 miles and the construction of a tunnel through a portion of the Alleghany Mountains. The plant site selected is at Natural Well, 10 miles north of Covington. This development, company officials state, is apart from the proposed Goshen Pass development. The company has not applied for a charter from the Corporation Commission of the state for the proposed development on Jackson River because the courts have held that this river is not a navigable stream. A development of 100,000 hp. is reported to be possible.

MINNESOTA STATE HOUSE DOME IS FLOODLIGHTED.—The dome of the Minnesota State Capitol in St. Paul is now floodlighted at night, the lights having been turned on first on October 21 as a part of the state's observance of "Light's Golden Jubilee." They are to be used every evening except Sunday, making the dome visible for many miles. The illumination is furnished mainly by 1,000-watt projectors, with four rated at 500 watts. Eight of the 1,000-watt projectors are on the ground 350 ft. from the Capitol, 24 on the roof within 150 ft. of the dome, 24 at the base of the dome and 24 behind the Capitol pillars. Near the top of the dome are twelve 1,000-watt projectors, illuminating the "lantern." Inside the lantern are four

1,000-watt projectors fitted with red lenses, and at the peak are four 500-watt projectors illuminating the gilded ball.

QUICK ELECTRIFICATION HELPS AUGUSTA, GA., COMBAT FLOODS.—When the Savannah River reached record heights at Augusta, Ga., a month ago it became certain that users of mechanical power supplied by the Augusta canal would face a shutdown unless other sources of energy were obtained. The Georgia Power Company came to the rescue by locating all the available electric motors in Augusta and arranging for others to be shipped from Atlanta. As soon as these motors arrived they were put in service at the mills affected by the floods. These emergency installations totaled 2,015 hp. The Augusta division staff handled the situation without assistance from outside, officials of the Westinghouse and General Electric companies co-operating. At the same time the power company's line crews were fighting the flood so effectively that not a single major interruption of light and power service in Augusta was reported.

Though the hydro-electric plant in Stevens Creek was under the water, the interconnected transmission lines of the company saved the day.

ECONOMY FORBIDS REGULAR FLOODLIGHTING OF NORTH CAROLINA CAPITOL.—Floodlighting of the North Carolina State Capitol at Raleigh has been discontinued and will not be resumed except on important occasions by decision of Nathan O'Berry, State Treasurer, who says that the estimated cost of between $8 and $9 a night is "too much just for beauty and show."

OREGON COMPANIES UNITE IN FARM EXHIBIT.—Through joint action of six power companies in Oregon, operating through the Oregon Public Utility Information Bureau, permanent equipment for exhibiting annually at the state fair the uses of electricity on the farm has been prepared. This equipment was shown for the first time at the fair recently closed in Salem. The power companies thus joining forces are the Portland Electric Power Company, Northwestern Electric Company and Pacific Power & Light Company, all of Portland; Mountain States Power Company, Albany; California-Oregon Power Company, Medford, and Eastern Oregon Light & Power Company, Medford. Home, poultry-farm, dairy and outdoor equipment and machinery are all shown.

MOBILE STEAM PLANT GOES ON LINE.—The new plant of the Southeastern Production Company at Mobile, built to supply electrical energy and process steam to a new paper plant of the International Paper Company, went on the lines two weeks ago. It has two generators, one of 6,000 kw. rating and the other of 2,000 kw. Under normal operation the 6,000-kw. machine will be tied in with the system of the Alabama Power Company and operated at a capacity determined by the steam requirements of the paper mill for process steam. The 2,000-kw. unit will be operated only at such times as the Alabama Power Company finds it advantageous to purchase energy from the Southeastern Production Company.

LOWELL RATE CONFERENCES END IN AGREEMENT.—The special committee of the Lowell (Mass.) City Council which has been conferring with officials of the New England Power Association relative to rate revision has reached an agreement under which the service charge formerly existing will be eliminated as a separate item in the rate structure, while the equitable principles of the former rate will be retained. The revision has been so arranged that no customer will pay a rate in excess of the former schedule. The former rate was a service charge of 50 cents per month, 7 cents per kilowatt-hour for the first 30 kw.-hr. and 6 cents for all excess. The new rate, effective November 1, is 75 cents for the first 4 kw.-hr., 7 cents for the next 26 kw.-hr. and 6 cents for all excess.

Recent Court Decisions

CONSTITUTIONAL PROVISIONS GOVERNING MICHIGAN MUNICIPAL PLANTS.—Affirming a decree of the lower court granting only partial relief to the Consumers Power Company in a suit brought by it against the city of Allegan, the Supreme Court of Michigan declared valid a special election which authorized the city to construct a hydro-electric plant, saying that the submission of two bond issues at separate elections did not void the vote and that inasmuch as the plant which the city planned to build could not be completed within the life of a contract preventing it from exceeding the generating capacity it possessed when the contract was made, no injunction could issue based on violation of agreement. Other technical issues were also resolved in the city's favor. A contention that the city could not issue bonds based on its project until it obtained a license from the Federal Power Commission had been sustained by the lower court, and from this decision the defendant did not appeal. (226 N.W. 680.)*

SUPREME COURT REFUSES TO ENJOIN FAIRBANKS-MORSE COMPANY IN TEXAS.—An appeal by the Texas Power & Light Company to the United States Supreme Court to continue an injunction restraining Fairbanks, Morse & Company from interfering with the Texas company's contracts in Texas municipalities has been denied. The Texas company complained that the Fairbanks-Morse company had endeavored to sell power-generating equipment to Commerce, Seymour and other cities in northern Texas by conspiring to induce the power company's customers to break their contracts and negotiate with the cities for their supply of energy. The United States District Court for Northern Texas granted an interlocutory injunction. Upon appeal by Fairbanks, Morse & Company the Circuit Court of Appeals for the Fifth Circuit (ELECTRICAL WORLD, August 10, page 297) set aside the restraining order, and it is this decision that the Supreme Court has sustained by refusing to review the case. In its appeal the Texas Power & Light Company contended that grave consequences would follow if the decision of the lower court was sustained, thus allowing a competitor in connivance with a municipality to destroy a public utility which has a lawful contract with the municipality. While recognizing the right of a city to enter into the public utility business, it was maintained that a competitive company should not be allowed to initiate such procedure for its own profit. The brief of the power company also contended that the lower court was in error in allowing Fairbanks, Morse & Company to carry out agreements with the cities to deliver and install plant machinery and equipment and to accept as payments monthly warrants payable out of net profits from operation.

PRIOR RIGHTS OF TELEGRAPH LINE TO TRANSMISSION-LINE ROUTE SUSTAINED AGAINST INTERFERENCE.—The Postal Telegraph-Cable Company in 1890 constructed and has ever since maintained a telegraph line in the town of Hamburg, N. Y. The Depew & Lancaster Light, Power & Conduit Company subsequently constructed a power line on the same street. The Postal company changed its poles and wires to avoid interference with its system and service by the Depew company's lines and brought suit in the Supreme Court of Erie County to recover the reasonable value of the work and material involved in such changes. That court rendered judgment in favor of the Postal company, which was unanimously affirmed by the Appellate Division and on appeal was affirmed without opinion by the Court of Appeals. The judgment said: "The plaintiff was the senior in occupancy of the location in question, and there is no reason why it should be asked to surrender its property rights to the defendant without being compensated by such defendant. By its refusal to obviate interference by the defendant with the plaintiff's lines and service, which interference could have been avoided by the expenditure of a few hundred dollars, the defendant has been unreasonable, and, if the plaintiff had not moved its poles and lines, the defendant would have unreasonably interfered with the service and the system of the plaintiff and with its property rights. The loss in a situation similar to that in the action at bar is more fairly placed upon the defendant, who is the newcomer, and who will spread its loss on its customers and its shareholders, than upon the plaintiff, the senior in occupancy, who should not be compelled to spread such loss upon its shareholders and customers."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

ESTABLISHED UTILITY COMPANY PREFERRED AS PURCHASE OF POWER PLANT OVER MANUFACTURING COMPANY WHICH SELLS SURPLUS ENERGY.—Sustaining an order made in 1927 by which the Baker River Light & Power Company (now the Pemigewasset Electric Company) was authorized to acquire the utility property of Fox & Putnam, of which the Parker-Young Company, a manufacturing concern selling surplus electricity, was also a would-be purchaser (the case having been remanded by the Supreme Court of the state after litigation by the Parker-Young Company), the New Hampshire Public Service Commission, following the principles of decision laid down by the court, said: "In the instant case there is a choice between permitting a recognized public utility to serve an area clearly capable of sustaining itself or permitting service to be given by a corporation whose 'business is primarily manufacturing,' which already sells surplus electricity to the residents of the town in which it is engaged in business. After considering 'the prevailing tendency of the times supported by public policy to equalize or apportion so far as reasonable the advantages as between rural and urban sections, and to promote the growth and prosperity of the whole community involved,' and weighing with other competent evidence the cost of service to the urban section in consequence of including in that area the rural section to be served, and 'the relative benefits and burdens which would be conferred and imposed upon each by the respective developments proposed by the two competing companies,' it is the belief of this commission, and we so find, that the public good requires denial of the petition of the Parker-Young Company."

News About Men of the Industry

D. E. Ackers Heads Kansas Section of N.E.L.A.

Dean E. Ackers, who was elected president of the Kansas section of the National Electric Light Association, as announced in the October 26 issue of the ELECTRICAL WORLD, has devoted his entire engineering career up to the present time to the utility industry in his native state, Kansas. Born in Abilene, he attended the University of Kansas, from which institution he was graduated in 1917. After spending two years in France in military service he entered the employ of the United Power & Light Company of Kansas in 1919 and from that date until 1924 he performed the duties of construction engineer and chief engineer. Then he was appointed operating superintendent of the Atchison division of the Kansas Power & Light Company, removing to Topeka early in 1927 as local manager of that district. Subsequently he became assistant general manager and finally general manager.

FRANK W. SMITH, vice-president and general manager of the United Electric Light & Power Company, New York, underwent an abdominal operation this week at the Post-Graduate Hospital, New York, and is now well on the road to recovery.

OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, was made the recipient of the Roosevelt Medal for Distinguished Service at a dinner in honor of the seventy-first birthday anniversary of Theodore Roosevelt, held October 27 in Roosevelt House, New York. The citation said in part: "A captain of great enterprises, an economist, rich in knowledge and experience; a practical idealist who set the powers of a penetrating mind and a rare spirit to work upon the tangled finance of a disrupted world. A diplomat who rejected the customs of diplomacy; straightforward, sagacious and just; persuasive, patient and limitless in resource; bridging chasms between nations, building causeways toward understanding and peace; envoy extraordinary of a new age."

CHARLES LEGEYT FORTESCUE, chief consulting transmission engineer for the Westinghouse Electric & Manufacturing Company, was recently made the recipient of the honorary degree of doctor of laws by Queens University. Mr. Fortescue is internationally recognized as an authority in his field. Much of Dr. Fortescue's early work was in the development of transformers. He developed a systematic design of transformer, the type S transformer line, an economic basis for water-cooled and self-cooled transformers, and worked out the so-called basic "faradoid" principles, giving the form and proportion for insulating surfaces. His work also has done much to advance the art of calibration of spheres, spark gaps and the Baum principle of transmission. During the past several years Dr. Fortescue has conducted many theoretical and field investigations of lightning phenomena, involving the use of the Norinder cathode-ray oscillograph.

Electrical Testing Laboratories Elects New Officers

A new alignment of officers of the Electrical Testing Laboratories brings to the presidency Preston S. Millar and to the position of vice-president Clayton H. Sharp and F. Malcolm Farmer. Mr. Millar has served since 1914 as general manager and secretary of the Laboratories and since 1919 as secretary of the Association of Edison Illuminating Companies. He is executive secretary of the lamp committee of that association. For many years he has been active in committee work, serving as chairman or member of numerous committees of the Illuminating Engineering Society, American Institute of Electrical Engineers, National Electric Light Association, Association of Edison Illuminating Companies and other bodies. During the war he was chairman of the committee on war service of the Illuminating Engineering Society and a member of the war committee of technical societies. He has contributed many papers before the several technical societies in the electrical field and is author of the section on illumination of the Standard Handbook for Electrical Engineers. He is a member of the American Institute of Electrical Engineers, a member and past-president of the Illuminating Engineering Society, a fellow of the American Physical Society and a member of the American Society for the Advancement of Science.

Mr. Farmer joined the staff of the Electrical Testing Laboratories in 1903 and was appointed chief engineer in 1912. He has had an extensive experience in industrial research, testing and inspection of electrical engineering materials and apparatus. Subjects to which he has given special attention are electrical measurements, electrical insulating materials and electric power cables. He has been active on committees of technical societies dealing with these subjects and has contributed numerous papers to technical literature. Mr. Farmer is a fellow of the American Institute of Electrical Engineers and the American Association for the Advancement of Science, a member of the American Society for Testing Materials, Institute of Electrical Engineers (British), American Society of Mechanical Engineers, American Welding Society, National Research Council, and of other engineering organizations. He is a past-president of the American Society for Testing Materials and the American Welding Society.

Since 1914 Dr. Sharp has been vice-president and technical director of the Laboratories. He was graduated from Hamilton College in 1890 and took his doctor's degree at Cornell. For six years he engaged in research and instructional work at Cornell with the exception of an interval of a year spent in Europe, and while abroad he did research work in the Physical Institute at Leipsic, Germany. It was in 1901 that he became affiliated with the Electrical Testing Laboratories.

Dr. Sharp is a fellow of the American Institute of Electrical Engineers, American Physical Society and the American Association for the Advancement of Science and a member of the Illuminating Engineering Society, American Optical Society, Société Francaise des Electriciens and of the Associazione Elettrotechnica Italiana. He is a past-president of the Illuminating Engineering Society and of the United States National Committee of the International Commission on Illumination, of which body he is an international vice-president. He is president of the United States National Committee of the International Electrotechnical Commission and in connection with the foregoing national commissions has made numerous trips abroad as one of the representatives of this country at international meetings. He is the author of many

technical and scientific papers and patentee of a number of devices in the electrical and illuminating field.

Electrical Testing Laboratories has attained to its present position of influence and confidence in the electrical industry under the presidency of John W. Lieb, who has served in that capacity since its incorporation in 1901. Mr. Lieb has now been made chairman of the board, the other directors being N. F. Brady, Charles L. Edgar, Samuel Insull, M. S. Sloan and W. H. Taylor.

R. W. PERKINS, vice-president of the Connecticut Light & Power Company and formerly president of the Eastern Connecticut Power Company, has been elected a vice-president of the Connecticut Electric Service Company.

N. R. Gibson New Vice-President of Buffalo Utility

At a meeting of the executive committee of the Buffalo, Niagara & Eastern Power Corporation on September 25 Norman R. Gibson was elected vice-president and chief engineer. Previous to his election Mr. Gibson was vice-president and chief engineer of the Niagara Falls Power Company. Starting in 1904, Mr. Gibson became draftsman for the Ontario Power Company of Niagara Falls, Ontario, and subsequently structural designer for the Niagara Falls Hydraulic Power & Manufacturing Company of Niagara Falls, N. Y. Later work included connections with Point du Bois power development for the city of Winnipeg, Manitoba; the First Street Bridge, Brandon, Manitoba; Smith, Kerry & Chace, consulting engineers of Toronto, the Ontario Power Company of Niagara Falls, Ontario, and the Electric Power Company, Ltd., of Toronto.

His first connection with the Niagara Falls Power Company was in February, 1918, when he became hydraulic engineer of the Hydraulic Power Company and later the Niagara Falls Power Company. For one year he served as executive engineer, and in February, 1926, was made chief engineer. In August, 1926, he was made vice-president and chief engineer of the Niagara Falls Power Company.

Mr. Gibson invented the Gibson method and apparatus for measuring the flow of fluids in closed conduits, patented in the United States, Canada and foreign countries, and has contributed numerous papers of interest to the technical press. He is a member of the American Society of Civil Engineers, American Society of Mechanical Engineers, the Engineering Institute of Canada, Engineers' Club of Toronto and a fellow of the Royal Society of Arts of England.

WILLIAM E. WOOD, retiring president of the Virginia Electric & Power Company, was the guest of honor at a dinner given at the York Beach Inn, Yorktown, Va., by officials of the company. J. F. McLaughlin, recently elected president of the Virginia Electric & Power Company, arrived in Richmond from Houston, Tex., October 26 and left almost immediately for Yorktown to attend the banquet. More than one hundred of the company's officials were present. As announced previously in the ELECTRICAL WORLD, Mr. Wood has been named vice-president in charge of operations of the Engineers Public Service Company.

Obituary

FREDERICK LEE BISHOP, vice-president and general manager of the Hartford Faience Company, Hartford, Conn., died October 15 at Tucson, Ariz., following a long illness. Mr. Bishop was 60 years of age and a native of Hartford. He became prominent as one of the organizers of the Hartford Faience Company, porcelain electrical supply manufacturers, and became vice-president and a director of the organization.

HENRY A. COLES, district manager of the Westinghouse Electric & Manufacturing Company, Atlanta, Ga., died in the Roosevelt Hotel, New Orleans, October 27. He was 63 years of age. Mr. Coles moved to Atlanta 30 years ago from Niagara Falls, where he had been sales engineer for the Westinghouse company. Mr. Coles was born August 17, 1870, at Tallwood, Va. He attended Roanoke College and in 1891 was graduated from the University of Virginia. After graduation, Mr. Coles spent a year with the Edison General Electric Company at Schenectady, resigning in 1892 to join the Westinghouse company.

HARRY A. ORR of Charlotte, N. C., and for long prominent in the electric light and power industry in the South, died October 26 at Anderson, S. C. He was a son of the late Dr. Samuel M. Orr, a pioneer in the electrical development which has meant so much to the Piedmont Carolinas. Following his graduation in electrical engineering from Auburn Polytechnic Institute, Mr. Orr accepted a position with the General Electric Company. He was identified with that company at Pittsfield, Mass., and later in Atlanta, Ga., serving as Southern representative. He became president of the Savannah River Power Company, Anderson, builder of the Gregg Shoals plant. He also was vice-president of the Anderson Water, Light & Power Company, of which his father was president. When his father died, he succeeded him as president and treasurer of the company, remaining in that capacity until the corporation was absorbed by the Southern Public Utilities Company in 1913, when he was made manager of the Anderson branch. In May, 1927, he was promoted to the position of manager of the Charlotte branch and since that time had made his home in that city. Mr. Orr was active in the National Electric Light Association, having served as president of the Southeastern section.

ALAN I. WILLIAMS, some years ago actively identified with the public utility properties at Olean, N. Y., died suddenly at his home in that city October 21. Mr. Williams was 83 years of age.

GEN. MORRIS SCHAFF, for many years a member of the former Massachusetts Gas & Electric Light Commission, died at his home in Southville, Mass., October 19, in his eighty-ninth year. He was a native of Kirkersville, Ohio, was a graduate of the United States Military Academy and had a distinguished career in the Civil War, in public affairs and literary pursuits. He retired from the commission in 1919. General Schaff's work in the regulative field was marked by a somewhat poetic temperament, unusual powers of analysis and striking independence of viewpoint. He was a valiant foe of reactionary ideas in corporation management.

ERNEST F. HARDER, aged 71, assistant to the vice-president of the Westinghouse Electric & Manufacturing Company and for over 40 years prominently identified with the electrical manufacturing industry, died at his home, East Orange, N. J., on October 13. His death was due to pneumonia. Mr. Harder was born at Rostock, Germany, on August 15, 1858. He came to the United States when he was 25 years old and secured employment as a foreman at the Garrison Alley Works of the Westinghouse Company of George Westinghouse at Pittsburgh, Pa. This was at the time when Mr. Westinghouse was beginning his work with alternating-current electricity, so that Mr. Harder was one of the first employees of the Westinghouse Electric & Manufacturing Company, and he remained with this organization all the rest of his life. In 1893 he was sent to the Newark Works, where he held the position of foreman. In 1895 he returned to East Pittsburgh, being first advanced to general foreman and four years later made assistant superintendent. In 1904 he was transferred to the Newark Works, at which time he was made superintendent, becoming works manager in 1918, and assistant to vice-president in 1926.

Financial and Statistical News

THE third major break in the drastic market liquidation brought ten leading utility stocks down 172 points, on the average, from the year's high. This was a cut of 63 per cent from top price quotations before banking support turned the tide and a sharp recovery was initiated.

——THE DECLINE IN PRICES has been sufficient to effect a very substantial rise in the yield of the public utility stocks, along with other groups. At the market close October 29 several utility stocks showed a yield approaching 4 per cent, against an average probably below 2 per cent a month ago.

——THE ELECTRICAL MANUFACTURING COMPANY STOCKS have been in the van of the selling movement. General Electric's low to date (October 29) was 210, against the year's high of 403. Comparable figures for Westinghouse were 100 and 292, Allis-Chalmers 37 and 75 and Crocker-Wheeler new 18 and 87.

October Output High

Evidence of continued electrical activity as recently as the middle of October appears in the weekly reports of the American Gas & Electric Company.

They indicate gains over the corresponding periods last year of 16, 19 and 17 per cent for the weeks ending September 28, October 5 and 12, respectively. These percentages are virtually equal to those reported earlier in the year. While a portion of the increase is due to the inclusion, in 1929, of statistics for the Ohio Southern Electric Company, the increase is in the main ascribed to actual growth in the territory served.

North American System Output Gains 12.7 per Cent

Electric output of the North American Company's subsidiaries for the twelve months ended September 30, 1929, was 6,650,000,000 kw.-hr., an increase of 12.6 per cent over the output for the preceding twelve months' period of the same companies in the five groups of subsidiaries operating in California, District of Columbia, Missouri-Illinois-Iowa, Ohio and Wisconsin-Michigan. This is about one-sixteenth of the output from all public utility plants in the country.

In the nine months ended September 30, 1929, the output was 5,102,400,000 kw.-hr., an increase of 12.7 per cent over the output of the same companies for the corresponding period of 1928.

Tata Company Considered Valuable Acquisition

The Tata Hydroelectric Agencies, Ltd., a half interest in which has recently been acquired by American & Foreign Power, comprises a group of hydro-electric companies in and near Bombay. These highly efficient enterprises are large suppliers of wholesale power. Gross earnings are approximately $5,000,000 annually and the companies have ample capacity for future development.

NORTH AMERICAN COMPANY LISTS STOCK.—New York Stock Exchange has authorized the listing of 561,781 additional shares (no par) common stock of the North American Company on official notice of issuance and sale.

Stocks Tumble to Year's Low

Deflation Hurls Majority Down Below Twenty Times Earnings —High and Low Priced Stocks Suffer Similarly— Recovery Under Way

WHILE many agreed that power and light stocks, along with the rest of the market, were inflated beyond anything justified by current earnings, few if any anticipated such a speedy and complete liquidation process. Leaders and new issues alike hurried downward, until at time of writing many issues have fallen to old low levels for the year and not a few beyond.

Utility stocks had reached heights beyond any other substantial group on a basis of the ratio between price and earnings. Several issues were selling over 40 times earnings before the liquidation commenced, and a large group were in the thirties. The ratio has been cut in half in the case of holding companies and has been reduced radically in the case of operating companies. In the group of stocks shown the average holding company ratio has been brought from 42 to 20 and the operating company average from 36 to 24, as of October 23. Further liquidation has brought the average to still lower levels.

That the industry is essentially sound and shows earnings growth well up to the average for the past decade is illustrated by the attached table of earnings and operating ratios. While some of the percentages of increase are out of line.

Stocks React to Old Lows Before Market Recovery

	Recent Earnings (Per Share)			Twelve Months Ended June	Stock Range 1928		Stock Range 1929		Closing Price October 28	Times Year's High	Earnings Present Price
	1926	1927	1928	1929	H.	L.	H.	L.			
American Gas & Electric	$3.59*	$4.19*	$5.22*	$5.75	195	117	224	128	134	39	23
American & Foreign Power	0.17	0.69	1.22	3.43	85	22	199	75	77	58	22
American Power & Light	4.62	4.66	4.49	5.01	95	62	175	81	79	35	16
American Water Works & Electric	2.18*	2.26*	3.10*	3.94*	68	46	199	67	80	50	20
Columbia Gas & Electric	2.46*	2.11*	2.79*	2.92			140	53	70	48	24
Electric Power & Light	1.45	2.10	2.37	2.79	49	28	86	40	36	31	13
Public Service of New Jersey	2.44	2.21	3.28	3.46	83	41	137	75	87	39	25
Standard Gas & Electric		5.83	6.57	6.60	84	57	243	80	105	37	16
Commonwealth Edison	11.49	12.59	12.33	12.43	220	165	449	209	315	36	25
Consolidated Gas of Baltimore	5.57	4.62	5.49	3.08	96	67	160	88	103	52	33
Detroit Edison	11.32	11.32	12.24	12.53	224	166	385	224	340†	31	27
Pacific Gas & Electric		2.66	3.05	3.52	56	43	98	53	60	31	17
Public Service, Northern Illinois	12.91	13.73	14.32	13.48	205	158	435	205	280	32	21

*Adjusted for stock increase. † October 25.

Current Earnings Reports of Electric Light and Power Companies

	1929	1928	Per Cent Increase	Operating Ratio 1929	Operating Ratio 1928
Associated Gas & Electric System (Year ended August 31)					
Gross earnings	$70,384,295	$41,653,196	69.0	53	55
Net earnings	32,864,481	18,519,931	77.0		
Central Illinois Light (Year ended September 30)					
Gross earnings	5,016,362	4,675,577	7.3	58	59
Net earnings	2,084,322	1,893,676	10.0		
Commonwealth & Southern and subs. (Year ended September 30)					
Gross earnings	146,338,038	133,899,754	9.3	49	50
Net earnings	74,797,988	66,838,389	11.9		
Consumers Power (Year ended September 30)					
Gross earnings	33,161,727	29,338,990	13.0	49	50
Net earnings	16,843,510	14,641,257	15.1		
Illinois Power (Year ended September 30)					
Gross earnings	2,869,185	2,697,738	6.4	63	66
Net earnings	1,051,178	914,109	15.0		
Kansas City Power & Light (Year ended September 30)					
Gross earnings	14,430,653	13,550,335	6.5	51	51
Net earnings	7,059,109	6,634,895	6.4		
Nevada-California Electric and subs. (Year ended September 30)					
Gross earnings	5,589,085	5,371,692	4.0	48	43
Net earnings	2,924,378	3,071,546	—5.0		
Ohio Edison (Year ended September 30)					
Gross earnings	2,262,199	2,056,381	10.0	48	52
Net earnings	1,185,816	978,658	21.2		
Southern California Edison (Year ended September 30)					
Gross earnings	38,975,932	33,830,995	15.0	33	33
Net earnings	25,941,686	22,747,129	14.0		
Southern Indiana Gas & Electric (Year ended September 30)					
Gross earnings	3,359,998	3,122,381	7.6	58	57
Net earnings	1,419,183	1,352,982	4.9		
Tennessee Electric Power (Year ended September 30)					
Gross earnings	14,262,572	13,154,672	8.4	51	53
Net earnings	6,953,330	6,214,063	11.9		
Utah Power & Light (Year ended August 31)					
Gross earnings	11,583,312	10,859,939	6.0	49	49
Net earnings	5,838,638	5,536,370	5.0		

some of them due to added properties, the average is in the neighborhood of 11 per cent increase in net earnings.

The yield on public utility stocks prior to the liquidation process had become exceedingly low. In a study made by Standard Statistics Company, Inc., nineteen holding company stocks showed an average yield of 1.9 per cent. The highest single yield of the group was 3.7 per cent. The lowest was 0.5 per cent, while six of the stocks pay no dividend. In the case of a group of fifteen operating companies the average yield is 2.3 per cent and the highest individual yield is also 3.7 per cent.

The same study shows that the holding company group averaged 31.4 times per share earnings and that the operating group averaged 23.8 times earnings on September 20.

Insull Supports Employees in Market Crisis

What appears to be a new employer-employee relationship is seen in the report that Samuel Insull placed his resources behind those of his employees who were threatened with serious loss or financial ruin in the recent market crash. It is also stated that Julius Rosenwald, chairman of the board of Sears, Roebuck & Company, took similar action.

It will be recalled that the head of Sears, Roebuck & Company acted in a similar capacity in 1921, when it was learned that a large number of the employees were dabbling in the stock market. It was intimated by an officer of the company that this was not a permanent policy but a means of saving employees once, thus enabling them to learn their lesson on the dangers of marginal trading on the part of the man of limited means.

In the case of both companies it is reported that investigations were made to learn what employees were in difficulty and brokers concerned were advised that what collateral was needed would be made available.

Utilities Are Not Overcapitalized *

By Halford Erickson
Vice-President Byllesby Engineering & Management Corporation

HOLDING and management companies are said to be responsible for overcapitalization and for rates for service that are unreasonably high as well as for extortionate earnings. These criticisms are not, as a rule, based on facts and can easily be refuted.

Comparisons of capitalization and property values show that public utilities, as a whole, are not overcapitalized. There are admittedly many forces tending to increase capitalization above the actual value of the property it represents. The first and most obvious arises in the marketing of securities. Utilities with the best of credit are seldom able to realize more than $95 net from the sale of $100 par value of securities, when discounts, commissions, brokerage, legal and other issuing and selling expenses are accounted for. In other words, for each $100 of money actually invested in property they must issue about $105 in securities.

Unforeseen contingencies often require that funds be obtained from the sale of securities without corresponding net increase in property value. Storms, explosions, fire and other accidents may necessitate immediate replacement of property in amounts too large to be met from any accumulated reserves or from operating expense. Again, the judgment and foresight of the best management is not infallible, and by reason of such unavoidable mistakes, property may be removed from service long before its normal life had expired. Radical changes in the development of communities, municipal regulations, and other requirements beyond the control of the utility may also produce similar results.

The credit and financial situation of the utilities has not always been as good as has been the case the past few years. It is not so long since that even the best among the utilities could not raise capital even on bonds without selling them at heavy discounts and without giving along with the bonds, either free or at very low prices, considerable amounts of stock. This made the cost of the capital very high and also resulted in what is commonly called overcapitalization. The reason why such practices had to be resorted to in order to obtain capital was mostly this, that the utility business was new, uncertain, risky and far from well established. As time has passed, much of this overcapitalization has been wiped out and it has mostly been so wiped out at the expense of the stockholders. In so far as the public is concerned, it has been benefited rather than injured by such practices, for through them better and better service at lower and lower costs has been developed, and this development is also one that could hardly have come about in any other way. Even today only the strongest utilities can sell their common stocks to the public at par. The situation has, in fact, been such that most of the subsidiary utilities have not been able to raise any part of their capital through the sale of common stock to the public, or to any one but the controlling holding company except at prohibitive costs.

On the other hand, there are forces tending to keep capitalization below property value. Utility property is to a great extent made up of a large number of relatively small material items, many of which are installed through regular maintenance work and whose cost is therefore charged to current operating expense. While individually small, the cumulative effect is often a substantial increase in the equity behind outstanding securities.

One of the greatest factors, however, in keeping capitalization within conservative limits is the self-interest of

**From a recent address at Public Utility Conference, Grand Beach, Mich.*

the holding companies themselves, coming as a direct result of present systems of regulation. The principal asset of the holding company is the common stock of its subsidiary operating companies, and practically all its income is derived from the dividends on such stock. The earnings of these subsidiary companies are limited by state regulatory bodies to a fair return upon actual property value, irrespective of the amount of securities outstanding, and if the total of bonds, preferred stock and other securities coming ahead of the common stock equals or exceeds this property value, nothing remains for return upon the stock owned by the holding company. The very existence of these holding companies, therefore, depends upon their ability to keep the total outstanding securities within the fair rate making value of the operated property.

In addition to this economic curb upon excessive capitalization, most regulatory bodies have direct authority over the issuance of utility securities. They may and do prevent the issue of securities not adequately backed by property value. It may be argued that this power applies only to the operating companies and does not extend to the issues made by holding companies. Nevertheless, as will be pointed out later, about the only collateral behind such holding company issues must originate with the operating property of holding company issues, hence the control is just as effective, though indirect, as that over operating company issues.

The restrictions by which security issues are surrounded are, in fact, such as to work against overcapitalization. In order to secure the needed capital, for instance, those who are responsible for and represent the company go to underwriters consisting of groups of bankers or other financial houses whose business it is to dispose of securities in the market to the individual investors. This has been found to be the most practical way for public utilities to raise the large amounts of capital required by them, for they are thus enabled to secure their required funds with the least loss of time and with the least expense to their companies. The underwriters are in the best position to market the securities to the individual investors because they maintain organizations that constantly keep in touch with the investing public.

SOUTHERN CALIFORNIA EDISON AUTHORIZED TO SELL STOCK.—Permission has been granted by the California Railroad Commission to the Southern California Edison Company, Los Angeles, Calif., to dispose of the remaining 163,285 shares of its 5½ per cent preferred stock at $24 per share instead of at $24.50 per share, as previously authorized, for a total issue of 1,276,715 shares.

WINNIPEG ELECTRIC TO ABSORB MANITOBA POWER.—Shareholders of the Manitoba Power Company have received an offer to exchange their holdings on a share for share basis for those of the Winnipeg Electric Company. More than 60 per cent of the common stock of Manitoba Power is now owned by Winnipeg Electric. At the present time there are outstanding 150,000 shares of Manitoba Power common, of which 59,010 are held by the minority interest. The capital stock of Winnipeg Electric at present comprises 500,000 shares of no-par common authorized with 200,000 shares outstanding. The offer expires November 10.

SIERRA PACIFIC ELECTRIC STOCK INCREASED.—Stockholders of the Sierra Pacific Electric Company October 11 voted to change the 80,000 shares of common stock of $100 par to 80,000 shares of no-par value and to increase the authorized number of common shares to 150,000. The stockholders of record October 14 have been offered the right to subscribe on or before November 4 for 23,000 additional shares of common stock without par value at $40 per share on the basis of one-fifth of a share of new common stock for each share of either preferred or common stock held.

BEAUHARNOIS POWER FIXES MANAGEMENT.—Arrangements have been made by which the management of the Beauharnois Power Corporation shall not be changed for ten years. The capital set-up includes five management shares, the holders of which will have the sole right for that time to elect the directorate. After that period the shares are convertible into class A common. The authorized capitalization of the new corporation is as follows: Five management preferred shares of no par value, 1,799,995 class A common shares of no par value and 3,200,000 class B non-voting common shares of no par value. Following the capital stock issues there will be offered next month an issue of bonds of the new corporation with a bonus of common shares. The Beauharnois Power Corporation will own all outstanding securities of the Beauharnois Light, Heat & Power, Beauharnois Construction, Beauharnois Land, Beauharnois Transmission and any other companies which may be incorporated to segregate the various branches of the parent corporation's activities.

Utility Offerings in October Meager

NEW offerings of electric light and power securities during the month of October totaled $31,725,000. In September new issues of this type totaled $102,555,000 and in October, 1928, $81,798,352.

Only six companies participated in the month's activities, the most substantial contribution having been made by the American Superpower Corporation in the form of first preferred stock, a piece of financing involving a total of $9,900,000. The average yield reached the 6.05 per cent mark. October brought the ten-month period to a close with a total of $798,860,000, as compared with $1,042,798,352 for the similar period of last year.

Another sizable offering was made by the Puget Sound Power & Light Company in the form of first and refunding mortgage gold bonds, amounting to $8,000,000, issued at 95¼ to yield 5.65 per cent.

New Security Issues of Electric Service Companies in October

Name of Company	Amount of Issue (Par Value)	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
American Superpower Corp.	9,900,000	..	First preferred stock		6	99	6.05
Central Vermont Public Service Corp.	$3,088,000		Preferred stock		6	96½	6.21
General Water Works & Electric Corp.	7,250,000	15	Convertible gold debentures, series B	In connection with acquisition of additional subsidiaries, to reimburse for additions and betterments to its present subsidiaries and for other corporate purposes	6	95¼	6.50
Puget Sound Power & Light Co.	8,000,000	20	First and refunding mortgage gold bonds, series A	Additions to plant and the discharge of obligations incurred in connection therewith or in connection with the payment of bonds and for other corporate purposes	5½	97¾	5.65
Southern Ohio Electric Co.	2,487,000	30	First mortgage gold bonds	To retire certain current indebtedness, for the acquisition of properties and for other general corporate purposes	5½	95	5.85
Montana-Dakota Power Co.	1,000,000	5	First mortgage gold bonds	To reimburse for additions and improvements to the properties heretofore made or under construction and for other corporate purposes	5½	98	6.05
Total			$31,725,000	Rights	$54,188,035		
Total amount actually realized			$30,950,195	Total financing for October	$85,138,230		

Business News and Market Conditions

ELECTRICAL equipment business is better on the Pacific Coast than for some weeks. Railroads and electric railways are buying heavily. In the north lumber and pulp mills are large buyers. October business is better than a year ago in the St. Louis and Middle West districts. Distribution equipment has been particularly active.

THE EASTERN DISTRICT reports electric control apparatus especially active. Sales of heavy equipment have increased.

SOUTHEAST AND NEW ENGLAND business is steady without exceptional features.

EASTERN

THE CLOSE of the month in the Eastern district carries encouraging aspects; there is good demand for equipment, excellent market stability, and advancing strength in inquiries; the latter gives a healthy tone to the outlook for at least 30 days to come, although industrial and railway accounts are expected to show slight tapering in that time.

CENTRAL station business continues active and gives good promise.

The call for heavy electrical equipment is a feature of current transactions. Notable awards of the week are for industrial account, covering two oil-electric locomotives, 300 and 600 hp. capacity, respectively, for the Ford Motor Company, to be furnished by the Ingersoll-Rand and General Electric Companies at a price of about $100,000; the Hocking Valley Railroad Company has placed an order with the Westinghouse Electric & Manufacturing Company for electrical equipment for a new coal and ore terminal at Presque Isle, near Toledo, Ohio, including apparatus for three power substations, the contract totaling about $500,000; electric service will be furnished by the Toledo Edison Company. A chemical company in northern New York has placed a commitment with a state manufacturer for a synchronous converter, switchgear, transformers and allied equipment to an amount of $200,000. An important d.c. motor installation is being made by a New York producer in a paper mill in the Philadelphia district.

A maker of electric control apparatus reports excellent business from the steel mills, with other lines showing a tendency to reduce immediate commitments. A prominent manufacturer of oil-electric locomotives reports orders for 45 such units during the present year, which is considerably in excess of other annual business in this line. Industrial demand continues to show good strength from the metal-working industries, chemical factories, textile mills, paper mills and food product plants; the call from the leather-working industries is improving. A producer of electric welding equipment states that trade has never been better, with inquiries showing expanding proportions. A manufacturer of electric signal apparatus in northern New York is running on a capacity schedule, with every indication of continuance for some months to come. Municipal demand for traffic control apparatus is good; the city of New York has placed an order with a local producer for equipment to cost about $35,000. A New York interest is furnishing a sizable quantity of substation equipment, including metering and accessory apparatus for a central station program in Texas. Line equipment account is holding well; the call for wire and cable shows betterment, with inquiries for line hardware, high-tension insulators and affiliated equipment following in same direction. A Pittsburgh manufacturer of conductor cable is supplying a large mileage for a transmission line in Mississippi. A maker of fractional horsepower motors says that business is falling off a little, but is still in advance of this time a year ago. A producer of vacuum cleaners has recorded the biggest month in the history of the company in October.

CONSTRUCTION PROJECTS

Westchester Lighting Company, Mount Vernon, N. Y., plans power substation at Mount Kisco, reported to cost about $50,000. Cornell University, Ithaca, N. Y., has authorized an addition to power house to cost $180,000. "New York Times," New York, has filed plans for a multi-story printing plant in Brooklyn, to cost $1,000,000. General Baking Company, New York, will carry out an expansion and improvement program at twelve baking plants in different parts of the country, and construction of six new plants, to cost close to $6,000,000. Eastern Tool & Manufacturing Company, Bloomfield, N. J., contemplates plant to cost more than $80,000. Rossman Corporation, Perth Amboy, N. J., will build units at floor and wall tile plant to cost $85,000. National Harris Wire Company, Newark, N. J., will carry out an expansion and betterment program to cost upward of $100,000. Fulper Pottery Company, Flemington, N. J., is reported planning plant unit to cost about $70,000, replacing pottery recently destroyed by fire. National Biscuit Company, New York, has filed plans for a baking plant at Newark, N. J., to cost $500,000. Morris, Wheeler & Company, Philadelphia, Pa., are completing plans for a steel fabricating plant to cost more than $300,000. Department of City Transit, Philadelphia, has plans for a power substation to cost $130,000. Pittsburgh Plate Glass Company, Pittsburgh, Pa., plans paint factory at Milwaukee, Wis., to cost close to $1,000,000. Celanese Corporation, Amcelle, Md., has approved plans for an addition to rayon mill to cost $600,000. Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will receive bids until November 12 for motors for the Norfolk, Va., navy yard (Schedule 2057); and at same time for snap switches and electrical supplies for eastern and western yards (Schedule 2099). The Bureau of Yards and Docks, Navy Department, Washington, will receive bids until November 6 for a mechanical stoker for the Boston, Mass., navy yard (Specification 6017.)

NEW ENGLAND

NEW ENGLAND electrical equipment sales are steady; during the past week motor, scheduled materials and electrical specialties were in good demand.

CENTRAL station supplies were spotty; heavy industrial electrical equipment is receiving attention through opening up of several interesting projects under negotiation.

Sales in power apparatus continue steadily; orders amounting to over $28,000 were received by one manufacturer; increase in plant facilities are noted; an eastern Massachusetts company added over 500 kw.; a western company recently increased its power requirements by nearly 1,000 kw.; small switch and control equipment orders are being received in good volume and are reported appreciably above last year. During the past week orders for large motors were of interest; several, ranging from 10 hp. to 50 hp., were noted by one manufacturer.

Central station equipment sales are promising, which, added to regular stocking up at this time, is an encouraging indication that business will carry over for the late months. One manufacturer reports activity in meter sales; insulator sales are steady; outside line materials are less active, though petitions are before New Hampshire commissions for the authority to carry the New England Power Company transmission line to the Massachusetts state line, presaging further activity in the requirements for service lines. Heavy electrical machinery is commanding attention; recent purchase of three hydro-turbine units rated at 33,000 kva. for a western Massachusetts municipal plant will be followed soon by orders for switch and control for this plant. Activity in electrical specialties is of interest; electric time control clocks are selling well, one company reporting weekly sales of nine; electric street signals are being considered and appro-

priations made, in one instance, amounting to $1,600 by a Massachusetts city. Electric appliances are meeting with favor; for the last week one group of central stations gained over 40 per cent in sales as compared with a corresponding week last year.

CONSTRUCTION PROJECTS

Congdon & Carpenter Company, Providence, R. I., will build storage and distributing plant for iron and steel products to cost $240,000. International Silver Company, Meriden, Conn., contemplates an addition to cost upward of $80,000. Scovill Manufacturing Company, Waterbury, Conn., plans addition to brass and bronze goods plant to cost $85,000. Electric Specialty Company, Stamford, Conn., plans addition to cost close to $50,000.

SOUTHEAST

VOLUME of business in the Southeast was reasonably well sustained last week, but there is a falling off in inquiries to be noted, probably attributable to a sense of caution brought about by the present stock market situation.

THE LARGEST central station order came from Baton Rouge, La., and was for three 15,000 kva. steam turbines and orders for transformers, switches and power house auxiliary equipment amounting to approximately $250,000 will probably be placed within the next 60 days by the same company.

An order was placed by a Georgia power company for a 775-hp. turbine. Some other orders from Georgia were for four 4,000-kva. transformers and 50,000 lb. of solid and stranded bare copper wire. Some other central station orders were for creosoted pine poles amounting to $10,900, distribution and small power transformers totaling $4,300 and one carload of weatherproof wire. A textile mill in Georgia ordered motor equipment amounting to $6,000 for a partial electrification project. A hotel in Nashville, Tenn., ordered a radio amplifying system costing $11,000. The Georgia Power Company has purchased the small privately owned electric distribution system in Chickamauga, Ga.

CONSTRUCTION PROJECTS

Virginia Public Service Corporation, Charlottesville, Va., plans hydroelectric power plant on Jackson River, near Greaver's Mill, Va., to cost $2,000,000. Benedict Coal Corporation, St. Charles, Va., will make extensions and improvements at coal mines, including tipple, to cost $225,000. Wise Coal & Coke Company, Dorchester, Va., plans extensions and improvements in properties, including tipple, to cost $175,000. Natural Cold Storage Company, Timberville, Va., plans addition to cost close to $40,000. Randolph Planing Mill, Elkins, W. Va., plans extensions and improvements in mill to cost about $75,000. Brown & Williamson Tobacco Company, Louisville, Ky., has filed plans for an addition to cost about $70,000 Universal Steam Motors, Inc., Lexington, Ky., plans plant to cost $100,000. Appalachian Electric Power Company, Roanoke, Va., plans substation at Charleston, W. Va., to cost $25,000. Pennsylvania-Dixie Cement Corporation, Kingsport, Tenn., is said to be planning extensions and improvements in local mill to cost more than $80,000. Southern United Ice Company, McComb, Miss., plans extensions and improvements in ice-manufacturing plant to cost $50,000. Bayou Power & Light Company, Bayou Labatre, Ala., plans transmission line to Cedar Point and vicinity, reported to cost more than $30,000. Mexican Petroleum Corporation of Georgia, Savannah, Ga., plans local oil refining plant to cost $850,000.

MIDDLE WEST

GENERAL good business continues in most sections of the Middle West. What little inactivity is noticeable in certain lines of industry is more strictly attributable to previous unusual activity than to present unsoundness of general business.

RECENT stock market fluctuations have had no appreciable influence on general business.

ELECTRICAL industry continues optimistic, although conservative, toward future business.

There has been a good demand for major apparatus with a sustained demand for distribution equipment. Some of the interesting orders placed this week include one for aluminum cable steel reinforced, valued at $300,000, one for suspension insulators valued at $80,000, 40,000 ft. single-conductor, 2,000,000-circ.mil 500-volt paper and lead-covered cable, 15,000 ft. single-conductor, 1,500,000-circ.mil paper and lead covered cable.

CONSTRUCTION PROJECTS

Quartermaster, Camp McCoy, Wis., will receive bids until November 7 for three motors and miscellaneous electrical supplies (Circular 21). Barnes-Ames Company, Superior, Wis., plans a grain elevator to cost $1,000,000. Wausau Iron Works, Inc., Wausau, Wis., will build an addition to cost about $50,000. Fitzjohn Manufacturing Company, Muskegon, Mich., will build an addition to commercial automobile body plant, to cost about $70,000. O. L. Anderson Company, Detroit, Mich., plans addition to metal stamping plant to cost about $90,000. White Star Refining Company, Detroit, Mich., will build two additions to oil refinery at Trenton, Mich., to cost about $100,000. Winkler Lucas Company, Saginaw, Mich., plans ice-manufacturing plant to cost $50,000. Otis Steel Company, Cleveland, Ohio, contemplates storage and distributing plant at Detroit, Mich., to cost about $100,000. Babson Manufacturing Company, Chicago, Ill., will build a dairy and barn equipment manufacturing plant at St. Charles, Ill., to cost $80,000. Edwin Pratt Sons' Company, Kankakee, Ill., plans an addition to iron and steel plant to cost about $85,000. Sterling Manufacturing Company, Chicago, Ill., plans addition to radio equipment plant to cost $65,000. Central Lime & Cement Company, Chicago, Ill., plans storage and distributing plant to cost $150,000. Firestone Tire & Rubber Company, Akron, Ohio, plans factory branch and distributing plant at Chicago, Ill., to cost $150,000. Davies Laundry Company, Chicago, Ill., plans addition to cost $100,000. Gold Leaf Milk Company, Chicago, Ill., plans prepared milk plant to cost $100,000. Commonwealth Edison Company, Chicago, Ill., plans power substation on North Dearborn Street, to cost $200,000. Indiana & Michigan Electric Company, South Bend, Ind., has plans for an equipment storage and distributing plant and automobile repair and service building to cost $100,000. Indiana Soldiers and Sailors Orphans' Home, Knightstown, Ind., has completed plans for a power plant at institution to cost $65,000. Stahli Auto Body Wagon & Spring Company, Cleveland, Ohio, contemplates plant addition to cost $65,000. Dayton Power & Light Company, Dayton, Ohio, has filed plans for addition to power plant on Eaker Street, to cost $200,000. Goodyear Tire & Rubber Company, Akron, Ohio, plans factory branch and distributing plant at Chicago, Ill., to cost $500,000. Reibel Baking Company, Cincinnati, Ohio, has filed plans for plant to cost $200,000. Sterling Grinding Wheel Company, Tiffin, Ohio, will carry out an expansion and improvement program to cost $100,000. City Machine & Tool Company, Toledo, Ohio, plans plant to cost in excess of $100,000. Great Northern Railway Company, St. Paul, Minn., is reported planning power plants at Great Falls and Whitefish, Mont., and Williston, N. D., each to cost about $85,000. St. Paul, Minn., plans an ornamental lighting system.

SOUTHWEST

VOLUME of sales of stock sizes of motors and transformers has been fairly good in the St. Louis district—only a shade below previous weeks.

MANUFACTURERS and jobbers agree that the business of the past month will be considerably ahead of October last year.

MANUFACTURERS of electrical advertising apparatus report this season's demand for sign installations to be far head of last year.

The only orders placed during the past week were for 20 miles of transmission pole line equipment for a southeast Missouri power company, amounting to $22,000, and a bank of three transformers with control panel to cost $3,750 for a southwestern mining company.

CONSTRUCTION PROJECTS

Missouri Farmer's Association, Columbia, Mo., contemplates milk plant at Carthage, Mo., to cost $100,000, and feed mill and elevator at Springfield, Mo., to cost $100,000. St. Luke's Hospital, St. Louis, Mo., has filed plans for power plant to cost $100,000. Thomas Poultry Car Company, a subsidiary of the North American Car Corporation, Chicago, Ill., plans railroad car plant at Springfield, Mo., to cost $75,000. Dodge City Terminal Elevator Company, Dodge City, Kan., plans grain elevator to cost about $350,000. Ada, and Miami, Okla., plan installation of flood lighting system and beacon lamps at proposed municipal airports, each to cost about $100,000. Crescent Macaroni Manufacturing Company, Houston, Tex., plans factory to cost about $75,000. Southern Air Transport Company, Fort Worth, Tex., plans aircraft plant at San Antonio, to cost $200,000. West Texas Utilities Company, Abilene, Tex., plans transmission line from Miles to vicinity of San Angelo,

about 20 miles. Pan-American Aero Corporation, San Antonio, Tex., contemplates aircraft manufacturing plant to cost close to $70,000. Farmersville, Tex., has approved plans for a municipal electric light and power plant. Lafayette, La., plans extensions in municipal electric light and power plant, including installation of additional equipment. Bogalusa, La., will receive bids until November 5 for ornamental lighting system. St. Martinville, La., plans extensions and improvements in municipal electric light and power plant, including additional equipment.

Pacific Coast

A NOTICEABLE increase is reported in buying by central stations and industrial sources in the North Pacific area.

PROSPECTS for the next 60 days are very bright with large orders from pulp and paper and lumber manufacturing plants to be placed.

The Board of Contracts and Awards, Tacoma, is taking bids until November 7 for the construction of the substructure and tailrace of Lake Cushman Power House No. 2 and the expenditure of from $6,000,000 to $8,000,000 is promised by the Powell River Company for hydro-electric development on Lois River in British Columbia, where a 32,000-hp. development is contemplated. The Washington Water Power Company of Spokane will build a 110,000-volt transmission line from Spokane to Kellogg, Idaho, a distance of 80 miles, and contracts for poles, wire, etc., are expected to be let shortly. Sales reported to central stations last week included about $5,000 worth of switchgear, $3,000 worth of Hotpoint automatic-electric ranges, a large number of busbar connections, a small motor-generator set and 40 transformers of 25 kw. capacity. Motor sales included 40 single-phase, from ½ to 3 hp., to a dealer in Idaho, twenty from 75 hp. down to lumber mills and about 30 from 100 hp. down to miscellaneous industrials. The Port of Tacoma on November 7 will open bids for about 40 motors, costing from $10,000 to $12,000, for a grain elevator. Ornamental street-lighting projects planned include a $7,500 system in Mount Vernon, a system in Anacortes and an installation in Olympia, costing about $10,000. The National Veneer Products Company, Seattle, plans the expenditure of $35,000 for machinery and specifications are expected to be given out shortly for equipment amounting to $200,000 for a lumber mill to be built at Kulshan, Wash., by the St. Paul & Tacoma Lumber Company, Tacoma.

Power company business rates better than industrial or contracting during the past week on the Pacific Coast generally. Carloads of hardware and strand and such miscellaneous projects as three 667-kva. transformers, $30,000 worth of reactors, a proposed power line from Lodi to the city's Mokelumne dam and a 25-mile power line from Seeth to Star Valley in Nevada are included. Railroad business is excellent, including much projected cabling and such orders as carloads of copper and iron wire and pole line hardware, a $45,000 Westinghouse motor-generator set for the Great Northern Railway and electric heating equipment for nearly 200 interurban cars operating out of Oakland. Lighting equipment is featured in the contracting business for window and showcase lighting and floodlighting for an oil station, this being the season for remodeling department stores preparatory to the holiday season. Street-lighting business includes a 166-standard job for Berkeley, a $5,000 installation for Gustine, eighteen standards for San Jose and projected extensions for San Luis Obispo, Sacramento and Bakersfield. An unusual floodlighting installation is planned for the new million dollar mausoleum of Los Angeles County. Bullock's department store of Los Angeles has just installed a complete modernistic lighting system, with paneled lights. Motor and transformer business continues excellent, due largely to continued hot dry weather, which has cleaned out the last fans in all stocks. One manufacturer reports having sold close to 2,000 pumping control sets in the central valleys this year.

CONSTRUCTION PROJECTS

Heintz & Kaufman, San Francisco, Calif., plans a radio experimental plant at South San Francisco to cost $70,000. United States Electrical Manufacturing Company, Los Angeles, Calif., plans plant addition to cost about $50,000. Los Angeles, San Jose and Claremont, Calif., plan ornamental lighting systems. Whatcom County Dairymen's Association, Bellingham, Wash., contemplates ice-manufacturing and cold storage plant to cost about $70,000. Bozeman, Mont., plans installation of flood lighting system and beacon lamps at proposed municipal airport to cost $45,000. Kellogg, Idaho, plans ornamental lighting system. Wells Power Company, Deeth, Nev., plans construction of transmission line from Deeth to Star Valley, about 25 miles, reported to cost upward of $85,000. Fallon, Nev., contemplates municipal electric light and power plant to cost about $100,000. Salt Lake City, Utah, plans ornamental lighting system. Fleetcraft Airplane Corporation, Pueblo, Colo., has plans maturing for plant to cost close to $100,000. Alamosa, Colo., plans installation of floodlighting system and beacon lamps at municipal airport.

Activities of the Trade

Power Show Will Demonstrate Marvels of Recent Progress

A demonstration of the rapid progress which has been made in power equipment of various classes will be made at the eighth national exposition of power and mechanical engineering, more familiarly known as the National Power Show, to be held at Grand Central Palace, New York, during the week of December 2.

Construction, operating and maintenance costs are cut by means of modern equipment, machinery, materials, methods, instruments, tools and supplies. Cheaper power invites competition. If your competitor's power costs are lower than yours, you are at a disadvantage. The converse is also true. Cheap power is largely a matter of control. If equipment is out of date, then one cannot expect to compete with rivals whose plant is up to the minute. Many new developments in engineering practice and policy will be brought out at the Power Show.

Westinghouse Equipment for Arlington Bridge

The electrical equipment for the lift span on the Arlington Memorial Bridge will be furnished by the Westinghouse Electric & Manufacturing Company. The bridge is located at Washington, D. C., and extends across the Potomac River, connecting the Lincoln Memorial with Columbia Island. The total length of the span is 2,100 ft. and it is made of eight granite-faced arch spans, each about 200 ft. long, and a double leaf bastule span in the center. The bridge itself will cost $14,000,000.

General Electric Sales Gain 24 per Cent

General Electric Company sales billed during the first nine months of 1929, announced by President Gerard Swope, amounted to $301,812,808, compared with $242,676,762 for the corresponding period last year, an increase of 24 per cent. Profit available for dividends on common stock for the first nine months of 1929 was $47,965,831, compared with $36,910,649 for the corresponding nine months last year.

	1929	1928
Net sales billed	$301,812,808	$242,676,762
Less: Cost of sales billed, including operating, maintenance and depreciation charges, reserves and provision for all taxes	263,316,462	213,350,234
Net income from sales	$38,496,346	$29,326,527
Other income, less interest paid and sundry charges	11,400,578	9,515,097
Profit available for dividends	$49,896,924	$38,841,625
Less: Cash dividends on special stock	1,931,093	1,930,975
Profit available for dividends on common stock (7,211,481.84/100 shares issued)	$47,965,831	$36,910,649

A comparative statement of sales and earnings for the nine months is given in the accompanying table.

The profit available for common stock for the nine months is equivalent to $6.65 per share in 1929 and $5.12 per share in 1928 on the 7,211,481 shares outstanding.

Allis-Chalmers Earnings Up 52 per Cent

Net earnings of the Allis-Chalmers Manufacturing Company for the quarter ended September 30, 1929, amounted to $1,200,253 after all charges including federal income taxes. This was equivalent to $4.20 per share on the old common stock, and compares with $743,624, or $2.86 per share, for the corresponding quarter last year. Comparative billings and net earnings by quarters for the nine months of 1929 and 1928 were as shown in the accompanying table.

	1929	1928
Billings:		
First quarter	$9,942,853	$8,415,254
Second quarter	12,103,793	8,979,359
Third quarter	12,246,281	9,337,925
Total nine months	$34,292,927	$26,732,538
Net earnings:		
First quarter	$1,013,375	$675,600
Second quarter	1,165,713	804,408
Third quarter	1,200,253	743,624
Total nine months	$3,379,341	$2,223,632

The current nine months earnings of $3,379,340 equal $11.92 per share on the old common stock, now being exchanged for new shares, and contrast with $2,223,632, or $8.55 per share, for the similar period in 1928, an increase of 52 per cent. Bookings for 1929 to September 30 totaled $38,002,546, compared with $26,679,724 in the corresponding nine months of 1928, a 42 per cent increase. Unfilled orders as of September 30, 1929, amounted to $13,390,833, whereas on December 31, 1928, they were $9,681,214, an increase of over 38 per cent.

Oil-Electric Locomotive Order Given

The Ford Motor Company of Dearborn, Mich., has ordered one 600-hp. and one 300-hp. oil-electric locomotive from the Ingersoll-Rand Company for the Rouge River plant. These locomotives will be furnished with General Electric equipment and will be built at the Erie Works.

TRICO FUSE MANUFACTURING COMPANY, Milwaukee, Wis., maker of fuses and fuse pullers, has moved its Chicago office to 549 W. Washington Boulevard, room 614.

PENNSYLVANIA PUMP & COMPRESSOR COMPANY, Easton, Pa., announces the appointment of Joseph W. Eshelman to represent it in Alabama district. The address is American Traders Bank Building, Birmingham, Ala.

Westinghouse Salutes Industry by Radio

Inaugurating a good-will series of radio programs dedicated to industry, the Westinghouse Electric & Manufacturing Company will endeavor to popularize America's great industries in elaborate programs weekly on a coast-to-coast broadcasting hook-up. A series of presentations, beginning Wednesday night, November 6, at 7:30 o'clock Eastern standard time, will be broadcast every Wednesday night on the blue chain of broadcasting stations, with supplementary networks, of the National Broadcasting Company heading up through WJZ, New York City. Something of the history, romance and progress of an individual industry will be extolled in a dramatic entertainment with a musical background.

Beauharnois Contract

The Canadian General Electric Company has secured a contract from the Beauharnois Power Corporation for the supply of electrical equipment for the excavating unit to be used in connection with the work on the new hydro-electric development on the St. Lawrence. The total value of the contracts to be placed by the Beauharnois Power Corporation during the coming year will be substantial. It is expected that these orders will be scattered over a large number of producers.

SERVEL, INC., has purchased the entire Swedish interests in patent rights to the "Electrolux" absorption refrigerator in the United States, its possessions, as well as Cuba and Canada.

CROCKER-WHEELER ELECTRIC MANUFACTURING COMPANY shareholders approved the change in common stock from 40,000 shares of $100 par to 400,000 shares no par.

VAN DORN ELECTRIC TOOL COMPANY, Cleveland, Ohio, is now using a new electric tool demonstration car to assist the jobber salesmen in demonstrating various Van Dorn tools in operation.

BEARDSLEE CHANDELIER MANUFACTURING COMPANY announces that Richard Williamson was elected vice-president in charge of sales of the Williamson line.

BAILEY METER COMPANY, Cleveland, has transferred its Boston office to larger quarters at 523 Public Service Building, 89 Broad Street.

WAGNER ELECTRIC CORPORATION, St. Louis, has opened a sales office at 734 Allen Building, Dallas, Tex., under charge of Alfred B. Emrick.

AIRPORTS LIGHTING, INC., 10 East 40th Street, New York, is organized to manufacture electric signal and lighting equipment for airports.

HYDROIL CORPORATION, Lebanon, Ind., has appointed J. W. Himmelsbach district sales agent with offices in Chicago, Ill.

THE EMPIRE STEEL CORPORATION, manufacturer of electrical sheets, Mansfield, Ohio, will construct two additional open-hearth furnaces. The new furnaces, to be ready for operation January 1, will give employment to 125 additional men.

THE LEWIS-SHEPARD COMPANY announces the purchase of a brick manufacturing building containing approximately 60,000 sq.ft. of floor space at Crawfordsville, Ind. The rapidly increasing business of the Lewis-Shepard Company demands additional factory space, and instead of putting up further buildings at Watertown, Mass., the company is going to operate the branch factory at Crawfordsville in order to serve its customers west of Cleveland. It is expected that production will be well organized at Crawfordsville by October 1. The Lewis-Shepard Company has increased its sales over 300 per cent in the last seven years.

THE COMMERCIAL INVESTMENT CORPORTION, New York, has signed an exclusive contract with Landers, Frary & Clark, New Britain, Conn., manufacturers of Universal electric washers, for the financing of installment sales for authorized dealers.

THE GILBY WIRE COMPANY, Newark, N. J., announces that its products will in future be handled by Arlington Bensel, who has been sales manager and vice-president of the Driver-Harris Company for more than twenty years.

THE NORTHERN ELECTRIC COMPANY, LTD., has moved its Vancouver, B. C., branch from its old premises at Water Street to a block just completed at Cambie and Robson Streets. This building was erected to the order of the firm at a cost of approximately $250,000. The manager of the Vancouver branch is J. F. Little, while W. C. Mainwaring is the sales manager of the company.

GENERAL REFRACTORIES COMPANY has appointed the Desch Supply & Equipment Company of Baltimore as its high-temperature cement dealer representative in the state of Maryland.

TRUMBULL ELECTRIC MANUFACTURING COMPANY has appointed S. B. Hallberg branch manager of the Chicago office and H. L. Wheeler manager of the New York district office.

GENERAL ELECTRIC SUPPLY CORPORATION announces that John L. Busey, formerly of Pacific States Electric Company, San Francisco, becomes manager of the New England division of the General Electric Supply Corporation with headquarters at Boston.

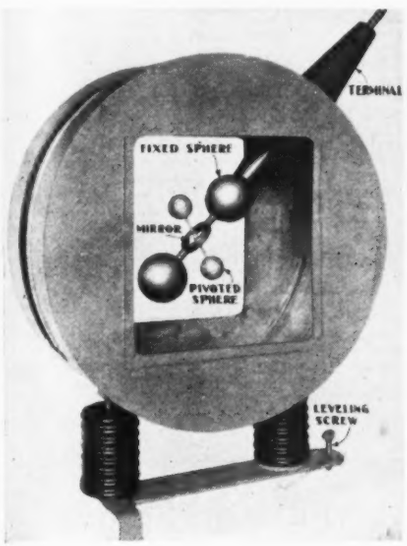
THE FEDERAL ELECTRIC COMPANY, Chicago, Ill., has concluded arrangements for the purchase of the plant and business of the Loper Fire Alarm Company, Stonington, Conn., established about eighteen years ago by A. P. Loper, who has been head of the organization since that time. The purchasing company will consolidate with its organization, removing the Stonington plant to Chicago at an early date. Mr Loper will continue as consulting engineer.

New Equipment Available

Electrostatic Voltmeters

A laboratory type electrostatic voltmeter operating on the principle of repulsion of similar charges and designed for voltages up to 100,000 is announced by the Delta Star Electric Company, Chicago.

The fixed spheres are connected to the potential to be measured and the shaft

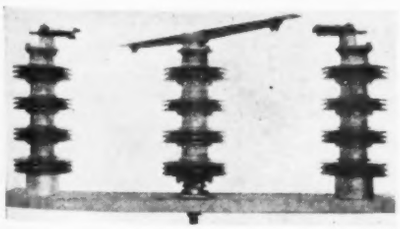


of the pivoted spheres carries a galvanometer mirror from which a light beam is reflected on a calibrated scale.

With this voltmeter the root mean square or the peak voltage may be measured, depending on the method of connection to the service. It offers an accurate means for the study of the electrostatic field.

Air-Break Switch with Fog Type Insulators

A new line of gang-operated air-break switches equipped with fog type insulators is announced by the Delta Star Electric Company of Chicago. The



outside units are stationary, the middle unit being mounted on ball bearings and revolved by an interconnecting mechanism which simultaneously opens and closes all three poles of the switches.

The fixed contacts are of the full-floating, self-aligning, self-closing type, the blade being equipped with an ice-breaking movement. These switches can be mounted in any position and when desired are equipped with arcing horns.

Fittings for Extension and Surface Raceway

The addition of a new elbow, catalog No. 2136, to its line of fittings for "Ovalduct" underplaster extension and surface raceway is announced by the National Electric Products Corporation, Pittsburgh, Pa. This new fitting takes "Ovalduct" into ½-in. conduit knockout or coupling and combines in one piece ½-in. conduit box connector, 90 deg. elbow and "Ovalduct" coupling. No. 2136 is made of drawn steel with smooth interior of maximum area; easily fished, no projections to injure wires and is scientifically designed to eliminate abrupt corners, thus allowing free passage of fish wire.

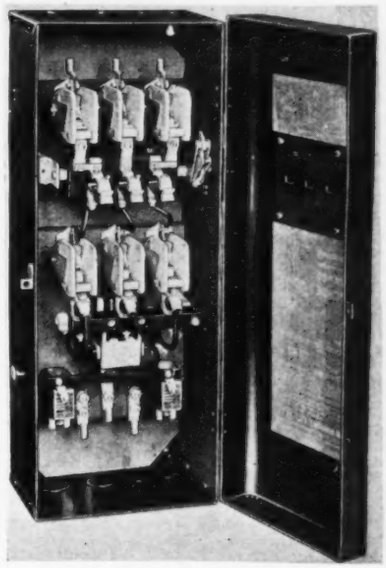
This fitting is equipped with flexible "Ovalduct" clamp and National ½-in. bondnut to assure a perfect ground. There are no set-screws. It is zinc treated inside and outside by the sherardizing process for protection against rust and corrosion.

A New Disk Sign Flasher of the on and off type, incorporating the contactor mercury tube switch, is being placed on the market by the Time-O-Stat Controls Company, Elkhart, Ind. The flasher has a copper disk inserted into an electrical field, with a magnet placed so that the disk cuts the lines of force perpendicularly when an alternating current is impressed into the circuit. Another magnet is placed beneath this disk, but not directly under the other magnet. The lines of force are then cut in a horizontal direction by one magnet and in a perpendicular direction by the other. This creates a force which propels the disk and imparts the desired motion to the shaft upon which it is mounted.

Starters Have Disconnects and Meter Test Jacks

The Allen-Bradley Company, Milwaukee, Wis., now furnishes its standard a.c. across-the-line switches equipped with hand-operated disconnect switches and meter test jacks in one cabinet. The disconnect switches are furnished with or without fuse clips. The meter test jacks permit the motor to be tested for load without opening switch cabinet or interfering with machine operation.

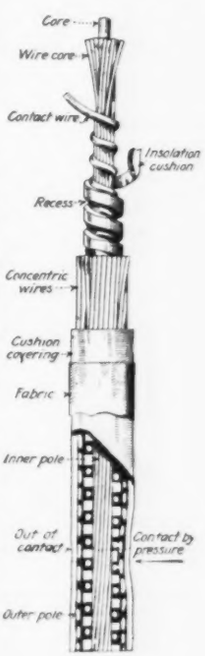
These switches provide overload, dead-phase and no-voltage protection. The type A switch will disrupt a locked motor current. The type B switch is a motor service switch that disrupts 150 per cent motor full-load current. The switches are rated up to 10 hp., 110 volts; 30 hp., 220 volts, and 60 hp., 440-



550 volts, and are furnished in three forms: Form 1, with push buttons in the cover; form 2, for pilot control, and form 3, with three-way lever switch.

Contact Cable

A new type of cable which by pressure upon any point throughout its entire length serves as a contact device is announced by the Contact Cable Corporation, 420 Lexington Avenue, New York, N. Y., under the trade name "Nagy Contact Cable."



There are various types of construction. One type has a steel core surrounded by a set of wires arranged concentrically. The wires are isolated by elastic material in such fashion that recesses are left between them.

The bare wires, normally out of contact, can be brought into contact by slight pressure on the outer walls. When pressure is released the wires are returned automatically by the elastic isolation to normal position. The conductors are therefore not insulated, but isolated. The outer form of contract cable may be round, oval, flat or of other shape and it is flexible. If cut, torn or burned it functions automatically by closing the circuit.

Electrical Patents

Announced by U. S. Patent Office

(Issued October 8, 1929)

1,730,735. SOLENOID; J. Kliegl, Hollis, N. Y. App. filed May 17, 1928.

1,730,740. ELECTRIC CABLE; J. J. Morrison, Worcester, Mass. App. filed Aug. 6, 1928.

1,730,745. LADY'S HAND BAG; F. Pucek, Chicago, Ill. App. filed Oct. 21, 1927.

1,730,764. HYBRID ELECTRICAL SWITCH; J. R. L. Green, Sacramento, Calif. App. filed March 3, 1927.

1,730,786. MEANS AND METHOD OF POWER-TRANSMISSION; H. Rosenthal, New York, N. Y. App. filed Sept. 5, 1924.

1,730,794. REMOTE CONTROL LIGHTING SYSTEM; G. G. Thompson, Bronxville, N. Y. App. filed July 16, 1924.

1,730,808. INFRA-RED RAY GENERATOR; T. L. Croom, Los Angeles, Calif. App. filed April 30, 1927.

1,730,810. LIGHTING FIXTURE; L. C. Doane, Meriden, Conn. App. filed Dec. 9, 1925.

1,730,831. THERMOSTAT; P. F. Shivers, Wabash, Ind. App. filed Nov. 21, 1927.

1,730,853. VARIABLE CONDENSER; V. D. Landon, East Pittsburgh, Pa. App. filed May 27, 1926.

1,730,856. TANK LINING; G. Lux, Berlin-Charlottenburg, Germany. App. filed June 7, 1926.

1,730,858. CONDENSER SYSTEM; R. E. Marbury, Wilkinsburg, Pa. App. filed Oct. 1, 1923.

1,730,861. METHOD AND MEANS FOR OPERATING ELECTRIC MOTORS; S. G. Nottage, Murraysville, Pa. App. filed April 23, 1926.

1,730,865. FUSE; M. J. Sandin, Wilkinsburg, Pa. App. filed Aug. 6, 1923.

1,730,873. ELECTRIC ATTACHMENT FITTING; L. Barnett, Brooklyn, N. Y. App. filed Dec. 22, 1927.

1,730,877. ELECTRICAL PROTECTIVE DEVICE; L. N. Crichton, Wilkinsburg, Pa. App. filed April 29, 1924.

1,730,881. HIGH-SPEED CIRCUIT INTERRUPTER; C. Le G. Fortescue, Pittsburgh, Pa. App. filed Aug. 17, 1920.

1,730,901. AUTOMOBILE SIGNAL; E. P. Rullmann, Milwaukee, Wis. App. filed June 22, 1926.

1,730,913. REACTION BRUSH HOLDER WITH RADIAL ADJUSTMENT; J. L. Brown, Verona, Pa. App. filed March 27, 1928.

1,730,945. FLEXIBLE CORD CONNECTION FOR ELECTRICAL APPLIANCES; J. A. Poole, Durban, South Africa. App. filed June 6, 1925.

1,730,951. AUTOMATIC STEERING FOR DIRIGIBLE CRAFT; E. A. Sperry, Jr., Brooklyn, N. Y. App. filed July 7, 1922.

1,730,952. COURSE MAINTAINING MEANS FOR AUTOMATIC PILOTS; E. A. Sperry, Jr., Brooklyn, N. Y. App. filed June 9, 1927.

1,730,966. METHOD OF AND APPARATUS FOR TESTING MAGNETIZABLE OBJECTS; C. W. Burrows, New York, N. Y. App. filed Oct. 3, 1923.

1,730,982. PORTABLE ELECTRIC HEATER; L. A. Pankratz and A. C. Pankratz, Waukesha, Wis. App. filed July 9, 1928.

1,730,988. PEDIODIC CAM-OPERATED CIRCUIT BREAKER; R. H. Wappler, Yonkers, N. Y. App. filed Dec. 22, 1922.

1,730,993. ELECTRICAL-WIRE FISH LINE; S. N. Buchanan, New York, N. Y. App. filed Jan. 31, 1928.

1,730,997. METHOD FOR CONVERTING SOLID CARBON INTO LIQUID HYDROCARBONS; P. Danckwardt, Alhambra, Calif. App. filed Jan. 13, 1928.

1,731,003. ELECTRIC CIRCUIT CONTROL DEVICE; J. De Giovanni, Brooklyn, N. Y. App. filed Feb. 2, 1927.

1,731,030. STATIC ELIMINATOR; H. L. Thompson, Elgin, Ill. App. filed Feb. 8, 1927.

1,731,039. ELECTRIC CONNECTOR; J. C. Belden, Lake Forest, Ill. App. filed May 19, 1927.

1,731,054. ELECTRICAL CONTACT MECHANISM; E. A. Mahannah, New York, N. Y. App. filed Dec. 21, 1926.

1,731,057. REVOLVING FIELD INDUCTION TOY AND NOVELTY; J. W. Overholt, West Allis, Wis. App. filed Mar. 19, 1927.

1,731,058. WATER HEATER; C. A. Pierson, Toledo, O. App. filed June 27, 1925.

1,731,065. ELECTRICAL SWITCH; A. G. Steinmayer, Milwaukee, Wis. App. filed Oct. 12, 1925.

Information on foreign patents can be obtained through the nearest district office of the Bureau of Foreign and Domestic Commerce, Department of Commerce.

1,731,068. HEAT-CONTROL REGULATOR AND ATTACHMENT DEVICE; S. Taylor, Glenside, Pa. App. filed June 14, 1928.

1,731,069. SURGICAL INSTRUMENT; F. P. Herman, West Palm Beach, Fla. App. filed Jan. 16, 1928.

1,731,075. STREET OR STATION INDICATOR; A. Masse, Beauport, Quebec, Can. App. filed July 13, 1925.

1,731,086. LAWN MOWER; J. Wise, Salina, Kan. App. filed Oct. 24, 1927.

1,731,119. ELECTRIC HEATER; C. C. Abbott and A. E. Hunt, Pittsfield, Mass. App. filed July 15, 1925.

1,731,120. HEATING UNIT; C. C. Abbott, Pittsfield, Mass. App. filed Oct. 30, 1925.

1,731,133. ELECTRIC SWITCH; C. W. Hewlett, Schenectady, N. Y. App. filed Oct. 26, 1927.

1,731,166. FURNACE; C. L. Ipsen, Schenectady, N. Y. App. filed Feb. 29, 1928.

1,731,170. OVERHEAD TROLLEY SYSTEM; S. S. Matthes, Mansfield, O. App. filed June 9, 1927.

1,731,188. ELECTRIC SWITCH; T. M. Avery, Glens Falls, N. Y. App. filed July 22, 1921.

1,731,200. AIR BREAK ELECTRIC SWITCH; G. W. O'Keeffe, Milton, Mass. App. filed May 19, 1928.

1,731,201. AIR BREAK ELECTRIC SWITCH AND OPERATING ELECTROMAGNETS THEREFOR; G. W. O'Keeffe, Milton, Mass. App. filed May 19, 1928.

1,731,205. LAMP SOCKET; T. J. Scofield and G. A. White, Jackson, Mich. App. filed Aug. 24, 1926.

1,731,218. ELECTRICAL CONDUCTOR; N. H. Adams, Schenectady, N. Y. App. filed Oct. 5, 1922.

(Issued October 15, 1929)

17,460 (reissue). ELECTRIC CIGAR LIGHTER; A. Schoeller, Frankfort-on-the-Main, Germany. App. filed May 6, 1926.

1,731,238. METHOD AND MEANS FOR OPERATING ALTERNATING CURRENT MOTORS; V. A. Fynn, St. Louis, Mo. App. filed Jan. 11, 1928.

1,731,239. THERMOMILLIAMMETER; H. A. Affel, Ridgewood, N. J. App. filed Jan. 15, 1927.

1,731,256. HEATING PLANT; E. O. Mills, Hamburg, Iowa. App. filed April 7, 1928.

1,731,269. PLIABLE TUNGSTEN AND METHOD OF PRODUCING THE SAME; M. N. Rich, East Orange, N. J. App. filed Jan. 23, 1925.

1,731,274. ELECTRIC CORD CONNECTER; S. Shaler, New York, N. Y. App. filed June 2, 1924.

1,731,297. METHOD OF AND MEANS FOR IMPROVING INSULATION OF CABLES; W. A. Del Mar, Greenwich, Conn. App. filed April 20, 1928.

1,731,329. SWITCHBOARD SIGNAL-LIGHT SOCKET AND RESISTANCE; F. D. Wyatt, Cincinnati, O. App. filed Dec. 4, 1928.

1,731,331. PROCESS OF CONDUCTING CHEMICAL REACTIONS; G. D. Bagley, Flushing, N. Y. App. filed Feb. 26, 1925.

1,731,350. SPLIT ROTOR CONSTRUCTION; H. V. Putnam, Edgewood, Pa. App. filed Sept. 2, 1927.

1,731,351. CONTROL RELAY FOR CIRCUIT BREAKERS; E. K. Read, East Pittsburgh, Pa. App. filed May 12, 1923.

1,731,367. SYSTEM OF TRANSMISSION; A. L. Atherton, Pittsburgh, Pa. App. filed Aug. 20, 1924.

1,731,372. GROUND RELAY; L. N. Crichton, Wilkinsburg, Pa. App. filed Aug. 11, 1923.

1,731,373. MOTOR-CONTROL SYSTEM; C. S. Dauler, Pittsburgh, Pa. App. filed April 30, 1926.

1,731,374. FRONT-WHEEL MOUNTING FOR MOTOR VEHICLES; A. Duresen, Minneapolis, Minn. App. filed May 23, 1925.

1,731,380. TERMINAL FOR RESISTANCE CONDUCTORS; W. R. King, Pittsburgh, Pa. App. filed July 7, 1928.

1,731,391. HIGH-SPEED CIRCUIT BREAKER; A. J. Mottlau, Pittsburgh, Pa. App. filed April 30, 1926.

1,731,392. INTERNAL-COMBUSTION-ENGINE GOVERNOR; R. A. Oglesby, Mishawaka, Ind. App. filed Aug. 12, 1927.

1,731,401. CLOCK WITH AUTOMATICALLY-TRAVELING ADVERTISING SURFACE AND ANNULAR CAP FOR THE CLOCK HANDS; A. Teckenburg, Hamburg, Germany. App. filed June 30, 1927.

1,731,415. PRODUCTION OF ELECTROLYTICALLY-DEPOSITED GOLD IN FILM OR LEAF FORM; W. F. Grupe, Rutherford, N. J. App. filed Feb. 23, 1927.

1,731,417. SAFETY DEVICE FOR SWITCHES; W. G. Hartwig, Chicago, Ill. App. filed April 12, 1926.

1,731,420. THERMOSTATIC DEVICE; R. P. Jackson, Berkeley, Calif. App. filed Sept. 9, 1927.

1,731,425. A.-C. COMMUTATOR MACHINE; J. Kozisek, Berlin-Charlottenburg Germany. App. filed Oct. 3, 1925.

New Trade Literature

LIGHTING EQUIPMENT SHIPMENT CATALOG.—The ninth of a series of catalogs by the Beardslee Chandelier Manufacturing Company of Chicago is offered the trade in catalog S 9. It contains 80 pages and lists 345 numbers that can be shipped immediately from factory stock.

AUTOMATIC CONTROL.—A new bulletin on automatic combustion control, designated as No. 181, is now being distributed by the Bailey Meter Company, Cleveland, Ohio. Features of Bailey control, such as automatic readjustment of fuel—air ratio by the steam flow—air flow relation of the Bailey boiler meter; the maintenance of any desired excess air at any rating, and a master pressure contactor which anticipates changes in steam pressure and sends out impulses to provide for the new conditions before they actually appear, are described in this bulletin. It also explains how flexibility in both operation and application is secured through the use of selective drum switches, intermittent drive units, high-speed reset clutches and other mechanisms which make possible the absolutely safe automatic operation of dampers and fan motors in the proper sequence. Interlocks to prevent a serious deficiency of air at high or low ratings; travel limits to protect against overtravel of dampers, rheostats, drum controllers and valves; time limits to prevent runaway conditions; handwheels for emergency operation and other safety features are covered in the bulletin. Illustrated descriptions of automatic control installations in the Avon station, Cleveland Electric Illuminating Company; Edgar station, Edison Electric Illuminating Company of Boston; Somerset station, Montaup Electric Company, and Long Beach plant No. 3, Southern California Edison Company, make up an interesting section of this 44-page bulletin.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Agency is sought in Tientsin, China (No. 41,480), for dry batteries.

Agency or purchase is sought in Milan, Italy (No. 41,541), for electric heaters and radiators.

Purchase or agency is sought in Lourenco Marques, Portuguese East Africa (No. 41,482), for electrical household appliances.

Agency is sought in Medellin, Colombia (No. 41,481), for electric household refrigerators.

Agency is sought in London, England (No. 41,584), for beauty parlor equipment, electrical vibrators, hair driers, etc.

Agency is sought in Bandjermasin, Borneo (No. 41,610), for flashlights and batteries.

Purchase is sought in Montreal, Canada (No. 41,636), of electric floor-scrubbing machine attachments.

Agency is sought in Bradford, England (No. 41,556), for electric generators.

Agency and purchase are sought in Berlin, Germany (No. 41,609), for household electrical appliances.

Agency is sought in Berlin, Germany (No. 41,648), for household electrical appliances.

Agency is sought in Vancouver, Canada (No. 41,555), for table and floor lamps and shades.

Agency is sought in San Juan, P. R. (No. 41,637), for lighting fixtures, chandeliers, etc.

Purchase is sought in Nice, France (No. 41,608), of fractional-horsepower motors.

Agency is sought in Berlin, Germany (No. 41,648), for electric household refrigerators.

Agency and purchase are sought in Berlin, Germany (No. 41,625), for restaurant and hotel electric appliances.

Agency is sought in Madrid, Spain (No. 41,557), for electric signs.

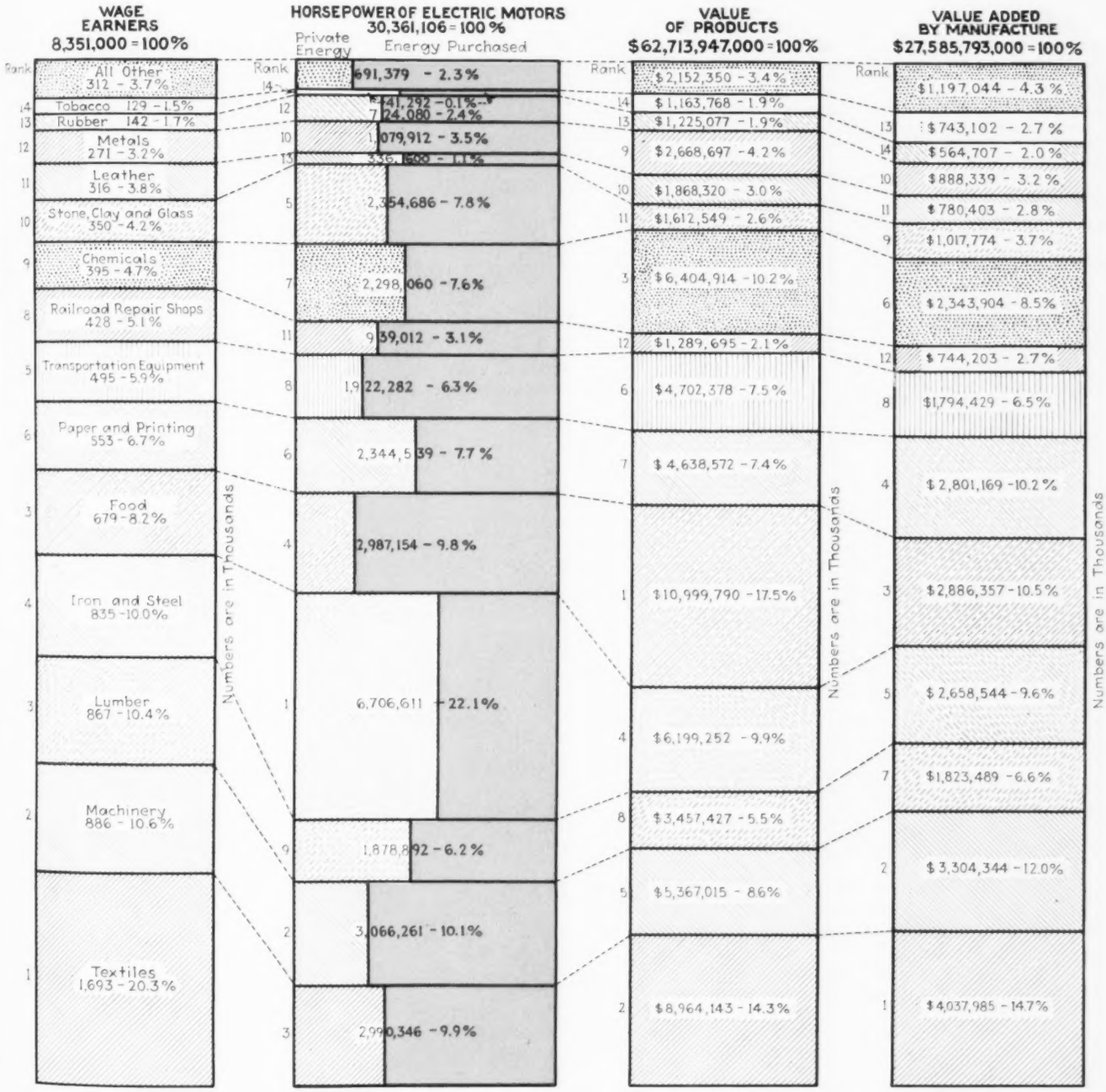
Agency is sought in Mexico City, Mexico (No. 41,604), for electric signs.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Men, Machines, Materials, Money

How the industry groups rank in importance according to four distinct methods of measurement



Textiles lead in number of wage earners, food products in value, steel and iron in electric horsepower. But of the latter, less than half is operated on purchased energy; 54 per cent of the installed motor horsepower is driven from the iron and steel industry's own generators.

The information is taken from the Census of Manufactures for 1927. The charts are reproduced by the courtesy of the National Industrial Conference Board, excepting the one on motor horsepower, which has been drawn for comparison directly from the census data.

New England Manufacturing Above Last Year

REPORTS on electrical energy consumption received by the ELECTRICAL WORLD from some 400 large manufacturing plants in New England indicate that September witnessed a seasonal increase in the operations of these plants of slightly less than normal proportions. The September rate of operations, after corrections are made for a number of working days, was 4.4 per cent above that of August and 2.5 per cent above September last year.

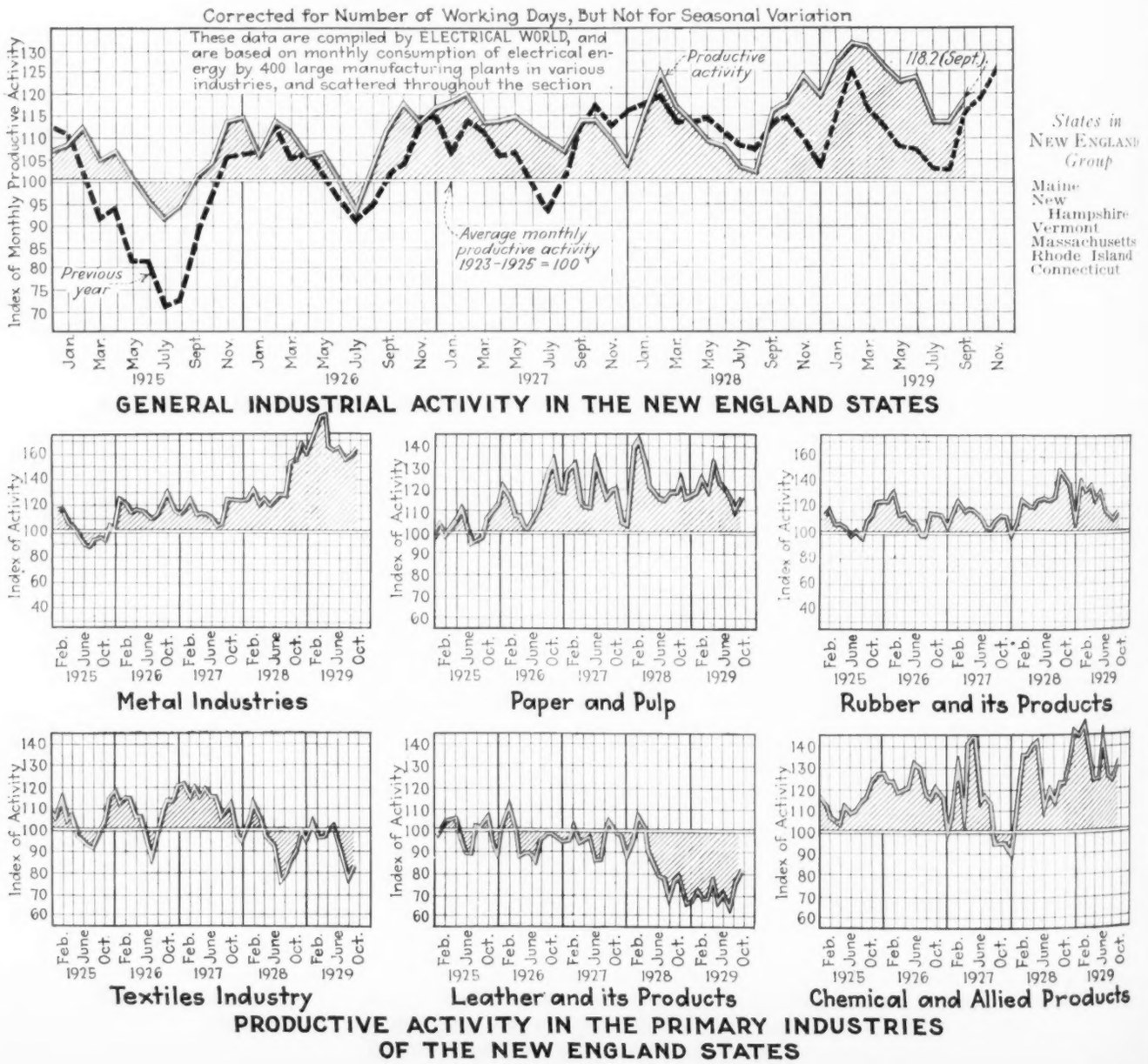
Five of the leading industries of the section report increases in rate of activity over September of last year—chemical products, 7.7 per cent; leather products, 5.7 per cent; lumber, 12.5 per cent; rolling mills and steel plants, 14.2 per cent; ferrous and non-ferrous metal making plants, 2.7 per cent. On the other hand, three of the most important manufacturing groups of the section report a September rate of operations under that of September, 1928—paper and pulp, 3 per cent; rubber products, 22.3 per cent, and textiles, 3.2 per cent.

The textiles industry in New England appears to have reached the low point of operations in August, and if the trend established in past years is followed, this industry should witness a gradual increase in activity during the coming four or five months.

Indexes of Productive Activity in the New England States
(All Figures Adjusted for Number of Working Days)

	September, 1929	August, 1929	September, 1928	Average First Nine Months 1929	Average First Nine Months 1928
All industry	118.2	113.2	115.3	123.1	112.1
Chemicals and allied products	132.6	124.0	123.0	134.7	126.4
Leather and its products	81.7	77.4	77.3	92.1	87.3
Forest products	85.0	93.9	75.5	88.4	99.0
Metals group	163.0	158.3	154.2	168.9	129.8
Rolling mills and steel plants	222.0	203.2	194.5	209.5	
Metal-working plants	142.0	140.5	138.2	152.9	
Paper and pulp	115.3	108.6	119.0	119.6	125.5
Rubber products	116.9	109.8	150.0	124.8	125.2
Textiles	82.5	77.5	85.2	93.4	94.6

ELECTRICAL WORLD *Barometer of Industrial Activity in the New England States*


Corrected for Number of Working Days, But Not for Seasonal Variation
These data are compiled by ELECTRICAL WORLD, and are based on monthly consumption of electrical energy by 400 large manufacturing plants in various industries, and scattered throughout the section
Productive activity
118.2 (Sept.)
Average monthly productive activity 1923-1925 = 100
Previous year
Index of Monthly Productive Activity
States in NEW ENGLAND Group
Maine
New Hampshire
Vermont
Massachusetts
Rhode Island
Connecticut
GENERAL INDUSTRIAL ACTIVITY IN THE NEW ENGLAND STATES
Index of Activity
Metal Industries
Paper and Pulp
Rubber and its Products
Textiles Industry
Leather and its Products
Chemical and Allied Products
PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE NEW ENGLAND STATES